Managing scientific patenting in French research organizations (1916-1951)

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For many years, public research organizations in France have been encouraged to step up their applications for patents, and by 2011 the share of patents granted to such institutions, compared to patents granted to corporate bodies, had indeed risen from 7% to 12%. In 2012, three public research agencies — the CEA, CNRS and INSERM — ranked among the top twenty French corporate patentees.[1]

This development was the result of several reforms designed to reduce the [alleged] gap between French and foreign research in technology by improving the links between universities and industry. Patenting was one aspect of the problem since French universities were not used to submitting patent applications. In 2006, French senator Philippe Adnot declared:

> "In protecting the results of research carried out in universities is a major issue because it lies at the heart of the definition of recoverable. Yet the policies to protect research are relatively new in the universities, either because the results were managed by other agencies, including within the framework of joint research units, or because the power relationship with the companies weighed against them."[2]

How can we explain the role of these agencies in the development of scientific patenting in France? And how can we explain the reluctance of French universities to patent? Our

1 INPI – Direction des études, *Chiffres clés 2013. Brevets*, juillet 2014, p. 14. CEA: *Commissariat à l'énergie atomique* (Atomic Energy Commission); CNRS: *Centre national de la recherche scientifique* (National Center for Scientific Research); INSERM: *Institut national de la santé et de la recherche médicale* (French Institute of Health and Medical Research).

2 P. Adnot, *La valorisation de la recherche dans les universités. Rapport d'information n° 341 fait au nom de la Commission des finances*, Sénat, 2006, p. 31. The quotation is my translation (RRB).

main assumption is that the answers to these questions are part of a long-term process, which started during World War I and lasted until the late 1950s.

I will begin by listing specific features of the relationship between science and patenting in nineteenth-century France. Then I will analyze patenting in French public research during the interwar period. Finally, I will examine the structures of French patent management in public research in the wake of World War II.

French scientists and patenting in the nineteenth century

It is important to recall certain features of science and patenting in nineteenth-century France.[3] Some of the most famous French scientists knew that patents existed and did not hesitate to use them, including Gay-Lussac, Louis Pasteur and even Pierre Curie in the early days of his career. This was not only a way to promote industrial development, it also helped prevent industrialists from imposing a monopoly on their own scientific discoveries. In the mid-nineteenth century the distinction between industrial inventions, which could be protected by patents, and scientific discoveries, which could not, was far from definitive. During the parliamentary debates on the adoption of the 1844 Patent Act, François Arago suggested that some scientists and lawyers defended the idea of ‘patents for principles’. Moreover, during the so-called ‘patent controversy’, scientists, industrialists and lawyers alike were perfectly aware that the outcome of extending the notion of intellectual property would be the emergence of ‘scientific property’.

Although French science and the French patent system were not two hermetic worlds in the nineteenth century, it is difficult to know whether there was some kind of patent management within scientific institutions since ‘research’ did not mean the same thing as it does today. It was disseminated in institutions such as the *Museum d’histoire naturelle*, the *Collège de France*, the *Conservatoire national des arts et métiers*, the *École pratique des hautes études*, the universities and in other scholarly societies. As far as we know, none of these institutions filed for patents before World War I. Corporate patenting existed in France, although it was not often practiced, but scientific institutions could not

3 G. Galvez-Behar, “The Propertisation of Science: Suggestions for an Historical Investigation”, *Comparativ. Zeitschrift für Globalgeschichte und vergleichende Gesellschaftsforschung*, 2011, pp. 80–97.

to apply for patents since they were generally public institutions. This was the case for universities. Under the Third Republic, the Napoleonic *Université de France* and its faculties gradually became regional universities.[4] In 1893, a law gave the *conseil des facultés*, which brought together all the faculties in the same city, a *de jure* existence. In 1896, the *conseil des facultés* adopted the term 'university'. The regulations adopted in 1897 to manage the budgets of universities and faculties make no mention of these types of institution taking out patents.[5] Until the early twentieth century, it seems that only individual scientists could take out patents in France.

The experience of World War I

Although collaboration between scientists and industry certainly pre-dates World War I, it was on the eve of the Great War that it took on new forms and that a new organization of relations between science and industry emerged. In this context, industrial property was at stake.

The mobilization of scientists and the question of patents

World War I witnessed the scientific communities of all the warring parties making a substantial commitment to the war effort. There is a consolidated body of research on the nature of this mobilization of science in weapons research.[6] Among the Allies, this meant the establishment of organizations such as the Department of Scientific and Industrial Research in the United Kingdom (1915), the Direction for Inventions and then Under Secretary of State for Inventions in France, and, before their entry into the war, the National Research Council in the United States (1916). These institutions were responsible for promoting the involvement of scientists, for selecting inventors' proposals and for coordinating the work of scientists and the military. They also promoted the

4 G. Weisz, *The Emergence of Modern Universities in France, 1863–1914*, Princeton, N.J., Princeton University Press, 1983; C. Charle, *La République des universitaires, 1870–1940*, Paris, Seuil, 1994; C. Charle et J Verger, *Histoire des universités: XII^e^-XXI^e^ siècle*, Paris, Presses Universitaires de France, 2012.

5 A. de Beauchamps et A. Générès, *Recueil des lois et règlements sur l'enseignement supérieur : comprenant les décisions de la jurisprudence et les avis des conseils de l'Instruction publique et du Conseil d'État*, tome 5, Paris, Delalain frères, 1898.

6 For a synthesis see, Anne Rasmussen, "Science and Technology" in John Horne (ed.), *A Companion to World War I*, Chichester, Wiley Blackwell, 2012.

exchange of scientific information among the Allies, and these exchanges were in turn formalized by meetings and inter-allied organizations.

It is worth noting the nature of scientific information exchanged within this epistemic community. Far from fitting the Mertonien ideal of scientific communalism, the exchanges among scientists were, in fact, very heavily constrained by military secrecy. The traditional networks of scientific publication were, so to speak, placed in parenthesis when it came to discussing or sharing work relating to the war effort. At the same time, there was another type of transmission of information and expertise through interpersonal meetings, correspondence and relations with the authorities. The proof of this lies, for instance, in the almost 400 reports sent by the U.S. scientific attaché in London, Dr. Henry A. Bumstead, to the National Research Council in 1918–1919.[7] In other respects, the question of the extent of free exchange of information and cooperation among the Allies was decisive. In a note to the National Research Council, the U.S. scientific attaché was quick to stress the proven loyalty of his British counterparts, inviting his U.S. colleagues to act in a similar fashion in sharing expertise.[8] On the whole, shared scientific information was not necessarily made public and the extent and form of its dissemination was cause for debate among the actors themselves.

The information and expertise at the heart of this national and international network was primarily oriented towards its industrial application. This immediately raised the question of industrial property rights in a context where all the belligerents had adopted protective and exclusionary rules. Patenting was either forbidden, or made very difficult, between the warring countries. Furthermore, the question of defence-related inventions lead countries to impose particular national conditions, as in France (1916), the United Kingdom (1916), and the United States (1917). The emergency nature of the conflict allowed the limitation, or even suspension, of patentee rights, especially when the holder was from an enemy country. Patent systems during wartime functioned in a very specific way, but patenting remained crucial, not only for firms but also for the inventors and

7 R A. Millikan, “Henry Andrews Bumstead”, *Science*, Vol. 53, No. 1361 (28 Jan. 1921), pp. 84–85.

8 Records of the U.S. National Academy of Science (thereafter NAS), General Relations, Research Information Service, Foreign Offices: London Reports, General, March 1918, Report #008 to NRC. Conversation with Admiral Sir Reginald Bacon, 13/03/1918.

scientists involved in the war effort. In France, inventors working for the national defense service did not forget their industrial property rights, even when they were acting as military scientists.[9] The *Direction des inventions* was anxious to protect inventors against 'plagiarism' and advised them to take out patents.[10] This was also the case for allied cooperation. For instance, soon after his arrival in Great Britain, Bumstead started up a correspondence with the National Research Council on the question of patents in inter-allied cooperation. He informed his correspondents of an exchange with the Controller of the Munitions Inventions Department, the British Admiral Reginald Bacon, who claimed that there was a gentlemen's agreement with the French on the question of property rights for military inventions.[11] Therefore, far from suspending such rights, the conflict gave industrial property issues a new importance and some scientists were even involved in the patent management of their own discoveries.[12]

The Langevin case

Paul Langevin's role in the conflict is an extremely eloquent example of the ambiguous nature of the economic aspects of this scientific mobilization and of intellectual property issues in general.[13] Langevin was appointed to work in the scientific war effort in October 1915, and dedicated himself to ultrasonic submarine detection. In May 1916 he filed for a first patent with the engineer and inventor Constantin Chilowski. Pursuing his research, Langevin decided to use Pierre and Jacques Curie's work on piezoelectricity to improve the device. At the same time, he was working with the Royal Navy on submarine

9 French National Archives (thereafter AN), 398 AP 02.

10 AN, F[17] 17486.

11 NAS, General Relations, Research Information Service, Foreign Offices: London Reports, General, March 1918, Report #008 to NRC. Conversation with Admiral Sir Reginald Bacon. 13/03/1918.

12 S. Katzir, "War and peacetime research in the road to crystal frequency control", *Technology and Culture*, January 2010, pp. 99–125; B. Lelong, "Comment coordonner laboratoires et essais en mer? Détecteurs à ultrasons et formes d'innovation dans les marines françaises et anglaises", *Documents pour l'histoire des techniques. Nouvelle série*, décembre 2011, pp. 85–95; G. Gooday, "Combative Patenting: Military Entrepreneurship in First World War Telecommunications", *Studies in History and Philosophy of Science*, A, 06/2013, 44(2): 247–258.

13 B. Bensaude-Vincent, *Langevin, 1872–1946: science et vigilance*, Paris, Belin, 1987; B. Lelong, "Paul Langevin et la détection sous-marine, 1914–1929. Un physicien acteur de l'innovation industrielle et militaire", *Epistémologiques*, vol. 2, n° 1–2, 2002, pp. 205–232; S. Katzir, "Who knew piezoelectricity? Rutherford and Langevin on submarine detection and the invention of sonar", *Notes and Records of the Royal Society*, June 2012, pp. 141–157.

detection. Early in summer 1918, the British Navy raised the question of filing a patent in Great Britain although Langevin's role was fully recognized by the British authorities.[14] So when he informed the Navy of his intention to file a patent in Britain, the Admiralty initially replied that it would accept on condition that it was taken out jointly by Langevin, Boyle and Rutherford.[15] Without waiting for a British response, Langevin took out a patent in his own name, and in France.[16]

As a result of his research on submarine detection, Langevin also worked on the development of a telegraphic wireless transmitter thanks to information received from the French military wireless service directed by Colonel Gustave Ferrié. In summer 1918, Commandant J. Colin, who worked with Langevin on ultrasonics, suggested that he contact the *Compagnie générale de radiotélégraphie* (CGR) to file for a joint patent. This initiative put Langevin in a very embarrassing situation. When informed of this request for a patent, the French military wireless service lodged a protest in the strongest possible terms and demanded that Langevin withdraw his application. Langevin wrote to Arsène d'Arsonval, doctor, physicist and then president of the CGR:

> "Thus I find myself having to take the following stand *vis-à-vis* the military wireless service in order not to refuse to implement steps taken without my knowledge by Commandant Colin. I was supplied with confidential information to facilitate a research enterprise with Navy resources for national defence ends and I took advantage [of this] to allow a private company to take out a patent for personal ends. The drafting of this patent is such, and I am assured in re-reading it more carefully, that it can confirm this impression. I am sure you will understand that this puts me in an intolerable position. The request for a patent must be withdrawn; this is all the easier as nobody will be materially damaged by this action."[17]

Arsène d'Arsonval, who was also professor at the *Collège de France*, and a member of the *Académie de médecine* and the *Académie des sciences*, was a key actor in the development of wireless telegraphy, and the holder of about fifteen patents on the eve of

14 Records of the *École supérieure de physique et de chimie* (thereafter EPCI), L138/172.
15 EPCI, L138/174.
16 INPI, brevet n° 505 703.
17 EPCI, L138/164.

World War I. His response to Langevin is interesting because it reveals his thorough knowledge of the economic interests at stake in the collaboration between science and industry:

> “There is much to say about the profit-sharing that the State demands of its employees; it should in return, at least reward them liberally for their research. Servicemen are better shared [sic.] than scientists like yourself. We give them stripes which increases their salaries. And when a scientist works with them, [Marcelin] Berthelot claims that if he does not always promote the question, he certainly promotes an officer. This is true for the Navy as it is for the Army.”[18]

Langevin’s wartime experience highlights several types of phenomena: the stepping up of links between science and industry — even to the point of making this distinction rather problematic — through the intensification of exchanges which no longer took the ‘normal’ forms of scientific communication, especially because of military secrecy. Nevertheless, the war did not ‘suspend’ the question of industrial property. Langevin invested in scientific research for industrial and military applications but did not forget to safeguard his rights: quite the reverse, the war actually seems to have introduced him to rights-based issues.

Patenting and the new organization of French public research during the interwar period

At the end of the Great War the scientific communities which had been involved in the war effort were faced with a series of problems: the sustainability of institutions set up during the conflict; the preservation of research funding; the reconstitution of a new generation of scholars following the immense loss of [young] lives; and the establishment of a new framework for international collaboration — with Germany being put, at least for the time being, in quarantine.

18 EPCI, L138/165.

Patenting at the *Office national des recherches scientifiques et industrielles et des inventions*

In France, the *Direction des Inventions*, which had encouraged collaboration between scientists and inventors, was under threat from the Senate which was trying to dismantle the special organizations created during the war. Thanks to effective lobbying, it was saved and in 1922 became the *Office national des recherches scientifiques et industrielles et des inventions* (ONRSII, National Office for Scientific and Industrial Research and Inventions).

It is worth noting that the ONRSII was soon committed to patent management. By helping inventors to implement their inventions, it reached some agreements with them, which included clauses on patenting. Generally speaking, inventors applied for patents in their own name but the Office helped them to pay the annual fees. If the invention were successful, the benefits would be shared between the inventor and the Office. While the inventors who were in contact with the Office were certainly not all scientists the Office was, for example, in charge of Langevin's patents. In a sense, it was one of the first scientific agencies in France, with its own patent policy, even if in 1920, the *Conservatoire des arts et métiers* passed a rule forbidding its agents "to take any patent for an invention whose object fits with the work of the department to which they belong".[19] Nevertheless, ONRSII policy was sharply contested by other official institutions. In 1934, the *Cour des comptes*, which controlled the use of public funds, reported that the patent management by the Office was an utter failure, with costs far outstripping income.

[Insert Table 1 & Figure 1]

Yet, in France, public patent management was not fully accepted in the early 1930s since it was considered a State intervention in [what was] a liberal economy. As regards the legal aspects concerning universities, this was probably one of the reasons why public research in France was not really involved in such policies, in contrast to the experiences

19 "Décret portant règlement du Conservatoire national des arts et métiers", *Journal officiel de la République française. Lois et décrets*, 31 mai 1920, p. 7900.

in the UK or the USA.[20]

Reorganizing research, preparing for war

In France, the ONRSII was repeatedly contested for its alleged inefficiency and some famous scientists, such as Jean Perrin, believed that pure research should be supported in other ways. Consequently, from the mid-1930s, public research in France was reorganized. In 1935, the *Caisse nationale de la recherche scientifique* (National Fund for Scientific Research) was created to merge different public funds in a single organization;[21] At the same time the ONRSII budget had been reduced to virtually nothing. Whereas the new *Caisse nationale* could spend money to "develop scientific research and to facilitate its improvements".[22] Patenting was not explicitly mentioned, but neither was it explicitly forbidden.

Jean Perrin was one of the key figures in this restructuring. He is often considered the champion of 'pure research', whereas Jules-Louis Breton, the director of the ONRSII, can be described as the representative of applied science. Yet during the Great War, Perrin was involved in the process of scientific mobilization and worked on the observation of aerial objects. In the immediate postwar period he began to patent inventions with his collaborators. As far as we know, he probably worked with the French company Barbier, Bénard et Turenne. In 1936, he became Under Secretary for Scientific Research and a central office was created within the Ministry of Education. On 24 May 1938, a decree was passed creating the *Centre national de la recherche scientifique appliquée* (CNRSA) and the *Haut comité de coordination des recherches scientifiques*.

This was an important moment for three reasons. First, the CNRSA continued the work of the now obsolete ONRSII. It managed all the patents and contracts which had already been settled by the Office. Although it dealt with applied research, the new research agency was committed to this kind of patent management. It was *explicitly* authorized to take out patents.[23] Moreover, from 1925, the ONRSII had been responsible for the

20 J. E. Robbins, *Solving the Patent Problem: Cognition, communication, and the National Academy of Sciences in the evolution of university patent policy, 1917–1966*, PhD, Pennsylvania, 2004.
21 J.-F. Picard, *La république des savants: la recherche française et le CNRS*, Paris, Flammarion, 1990.
22 *Journal officiel de la République française. Lois et décrets*, 3 juin 1936, p. 5845.
23 *Journal officiel de la République française. Lois et décrets*, 14 septembre 1938, p. 10 814.

process of ‘scientific mobilization’ in the case of war. This was based on the inventory of laboratories and in plans for their evacuation in the case of invasion. In a context of diplomatic tensions, the *Haut comité* had to prepare French public research for a possible conflict and, more generally, to plan a new structure for research. The question of scientific patenting was one aspect of this reorganization, as suggested by Jean Ullmo’s report in 1939:

> “[Researchers’] employment contract[s] shall provide that, if research led to a discovery which leads to a patent, the patent will be owned by the State; which funded the research. The National Centre will be in charge of the use of the patents. The scientific property of the discovery will remain with the author.”[24]

The question of patenting was explicitly linked to the question of the status of scientific workers. Industrial property had progressively become one of the key issues in the new management of science.

This link between the institutionalization of research and patenting was especially important in certain scientific domains such as physics. The case of nuclear research is very interesting. In the 1930s patents were one of the competitive tools used by nuclear physicists.[25] Enrico Fermi and his Italian colleagues filed for a patent in Italy on 26 October 1934, in the USA on 3 October 1935, and in France on 26 October 1935 through the firm Giannini & Co.[26] After an initial delay, French physicists followed suit.[27] In May 1939 Frédéric Joliot-Curie decided to file for three patents through the *Caisse nationale*, which had funded his research.

Research in nuclear physics required partnership with industrialists in order to obtain raw materials. It is no coincidence that the *Caisse nationale* filed for patents while Joliot was negotiating with the *Union minière du Haut-Katanga* to obtain uranium oxide: patents were a guarantee for scientists and industrialists alike. Furthermore, Joliot’s patents were a key element on which the first patent management in French scientific organizations

24 AN F^{17} 17490, Jean Ullmo’s report.
25 S. Turchetti, “The invisible businessman: Nuclear physics, patenting practices, and trading activities in the 1930s”, *Historical Studies in the Physical and Biological Sciences*, September 2006, pp. 153–172.
26 Italian Patent, U.S. Patent 2 206 234; French Patent 796 795.
27 M. Pinault, *Frédéric Joliot-Curie*, Paris, O. Jacob, 2000.

would be based.

[Insert Table 2]

The CNRS as the heart of scientific patenting, 1939–1958

On 2 October 1939 a new decree created the *Centre national de la recherche scientifique* (National Center for Scientific Research, CNRS), which merged the CNRSA and the *Caisse nationale.*[28] The CNRS became responsible for a pre-existing institution devoted to promoting inventions: the *Commission supérieure des inventions* (High Committee for Inventions, CSI), which had been created in 1887 to review inventors' proposals submitted to the military. The CNRS also had to manage the contracts negotiated by the ONRSII. And last but not least, it held the rights to Joliot's patents. It was thus a centralized research agency, with its own laboratories — even if it worked with other university laboratories —, its own staff and with a culture of patenting, inherited from earlier institutions.

The *Centre national de la recherche scientifique* at war

One of the first tasks of the CNRS was to manage Joliot's patents and on 12 March 1940, a legal committee was set up to examine the issue.[29] There were plans to set up a company to implement the patents, but this was interrupted by Germany's invasion of France. Yet, in a sense, during this short time, the foundations for the patent management office were laid at the CNRS. In 1939 Raymond Weiss had already been asked to help the CNRS in managing Joliot's patents.[30] Weiss was a legal adviser at the *Institut international de coopération scientifique* (International Institute for the Intellectual Cooperation, IICI) and one of the main actors in the on-going interwar debate on scientific property. He successfully recommended one of his collaborators, as patent officer at the CNRS, but he died and had to be replaced.

The new patent officer was Henri Volkringer[31]. Born in 1898, he was a former student of

28 D. Guthleben, *Histoire du CNRS de 1939 à nos jours: une ambition nationale pour la science*, Paris, A. Colin, 2013.
29 AN, 19760356/75.
30 AN, 19760356/77.
31 AN, 19760356/74.

the *École normale supérieure*. By 1923 he was a qualified teacher, a doctor in physics and also a law graduate. He taught at the Sorbonne and worked for a patent agent.[32] He was also known for his works on the history of physics. In 1929, he published *Les étapes de la physique* (*The Steps of Physics*), which had received an award from the *Académie des sciences* in 1931 thanks to the intervention of Émile Borel and Jean Perrin.[33] In the 1930s he contributed to learned journals such as *La science* and gave lectures while continuing his scientific work under the patronage of Aimé Cotton and Charles Fabry. Despite his place in this particular *milieu*, Volkringer did not manage to find a permanent job. Thus, early on in World War II, we find him assisting the secretary of the CSI, the mathematician and computer pioneer, Léon Couffignal, who was also a patentee.[34] Much later, in April 1940, Volkringer was hired to head the new CNRS Patent Committee.[35]

The French defeat in 1940 did not prevent the CNRS either from continuing its activities or from patenting. In actual fact it reorganized the institutions, which had been used during World War I, to review inventors' proposals. The *Commission supérieure des inventions* still existed and some scientists, like the young physicist Yves Rocard, belonged to it.[36] But the CSI was not considered to be very efficient and, in February 1942, a new committee was created: the *Commission des inventions et des brevets* (Committee on Inventions and Patents, CIB), which had less members than the previous one.[37]

Furthermore, the CNRS promoted partnerships with industrialists and some contracts were negotiated with industrial organizations. This was the case with the *Groupement français pour le développement des recherches aéronautiques* (French Group for the Improvement of Aeronautical Research, GRA), which was created in 1938 by the French national aircraft companies and the Ministry of Aviation to promote research in

32 See http://data.bnf.fr/ark:/12148/cb10459049d, consulted on 5 September 2015.
33 *Le Mercure de France*, 15 janvier 1931, p. 407, note 6.
34 AN, 19790228/2, Commission supérieure des inventions, 9 octobre 1939.
35 AN, 19760356/74, Conseil d'administration, 12 avril 1940.
36 The figure of Yves Rocard is particularly interesting. He was a former student of the *École normale supérieure*, and became lecturer of physics at the University of Paris in 1939. He also had a 'private' career. In 1927 he applied for a patent (after a partnership with Philippe de Rothschild) and was hired in 1928 by the firm *La Radiotechnique*.
37 AN, 19860369/24, Conseil d'administration du CNRS, 11 février 1942.

aeronautics.[38] The CNRS made some of its facilities and staff available to the GRA and the contract focused on the question of patents and publishing: discoveries made in the framework of this partnership were owned by the GRA, whose authorization was required for publication. During the war, the GRA applied for about fifty patents in France and abroad.

World War II did not interrupt the process which had begun in the 1930s. On the contrary, scientific research institutions devoted to the promotion of invention were still financed, the interest for scientific patenting increased, and patent management was better structured thanks to the organization of public research.

New French research agencies and patenting: Joliot revisited

The Liberation in 1944 and the drive for reconstruction also meant a reorganization of public scientific research. In a way, this was not a breakdown of the existing system, but a continuation of a process initiated in the mid-1930s. Some institutions, which had been created during the Vichy *régime*, were maintained such as the *Institut national d'hygiène* (National Institute for Health, 1941), the *Office de la recherche scientifique coloniale* (Office for Colonial Scientific Research, 1943), and the *Centre national d'études des télécommunications* (National Centre for the Study of Telecommunications, 1944). Other institutions were created *ex novo* in the immediate aftermath of the war, such as the CEA (Commissariat à l'énergie atomique) in October 1945, the *Institut national des recherches agronomiques* (National Institute for Agronomic Research), and the *Office national de recherches et d"études aéronautiques* (National Institute for Research in Aeronautics) in 1946.

The CNRS continued to exist and Frédéric Joliot-Curie became its director in 1944. Joliot was also the first High Commissioner for atomic energy because of the creation of the CEA. The question of the patents was central to the development of the CEA and, more generally, for the improvement of a French nuclear industry. Actors interested in nuclear energy were perfectly aware that patents were necessary to allow scientific collaboration and international partnership. However, this is not the place to describe the problems

38 E. Chadeau, *De Blériot à Dassault: histoire de l'industrie aéronautique en France: 1900–1950*, Paris, Fayard, 1987.

related to patents in the early days of the CEA. We can, nevertheless, mention the position, which Joliot expressed in March 1946 during a meeting of the Scientific Committee of the CEA. He was convinced of the need to focus on patents and suggested not only working with patent agents but also recommended hiring an engineer to manage this kind of question within the CEA.[39]

Soon after his nomination, and despite the possible conflict of interest, Joliot — and his colleagues — wanted the CNRS to submit their patents to the CEA. The procedure was quite difficult because some patents were taken out by the inventors themselves and not by the CNRS. The objective was thus to secure the ownership of the CEA without taking risks with the validity of the original patents, which had been filed for abroad. It took three years (1944–1947) to complete this process. Joliot insisted on having a specific clause in the contract between the CNRS and the CEA: if the CNRS granted its patents free of charge, then 'pure' research had to be rewarded if these patents were successful and economically profitable. In a sense, Joliot put into practice the principle of 'scientific property', which had been demanded by scientists in the 1920s: science had to benefit from the profits it generated.

The 1951 reform

Thus patenting played an important role during the emergence of a new institutional framework for science in France, but patent management was still a delicate affair in these new organizations. In 1945, Volkringer tried to strengthen his own position by suggesting a new organization for the Department of Inventions and Patents. His intention was to coordinate applied research through a single institution for inventors to submit their inventions. In a sense, this was an attempt to keep the old system inherited from World War I. What Volkringer wanted was a new dimension for his Department: it would not only protect inventors but also CNRS agents' inventions; it would not only protect them, but also help them to implement their plans. This proposal did not meet with success, probably because its aim was not really to introduce something but to maintain the existing Department. In 1950, however, this project was revived and a year later a decree made the CNRS the main actor for scientific patenting. This decree stated

39 Institut Curie, Fonds Curie, F 18, Comité scientifique du CEA, 12 March 1946.

that:

> "[...] at the CNRS, under the authority of the centre's director a Department for Inventions has been created to study and develop inventions, by the staff of the Ministry of Education or organizations and researchers funded by it.
> This Department can also study and develop inventions *made by any person or public or private organization, provided that such inventions were/are accepted by the CNRS, taking into account their scientific character or their general economic interest*."[40] [the two paras. are a bit repetitive, 'study and develop']

Article 2 added that :

> "For inventions of the kind mentioned in Article 1, the tasks of the Department for inventions are: 1. Inquiring about their value and their degree of novelty; 2. Participating in the development of inventions, including the creation of models and prototypes; 3. Providing for, if appropriate, filing patent applications both in France and abroad and, in general, providing for the protection of the industrial property rights of inventors and of the CNRS; 4. Negotiating and entering into agreements for the purpose of exploitation, taking into account the rights of inventors."[41]

In a sense, the Department of Inventions at the CNRS was a revival of the ONRSII. But the most important point is that the CNRS was supposed to centralize the development of research made in institutions on the authority of the Ministry of Education, and this included the universities.

Although Volkringer's Department received new prerogatives, its reputation was mixed. At the conference celebrating the fiftieth anniversary of the CNRS in 1989, the chemist Jean Jacques declared:

> "The structuring of the CNRS is also made with respect to inventions. I am thinking in particular of the office of inventions directed by Henry [sic] Volkringer, a room of 3.50m^2 at the Quai Anatole France, which stood for absolutely nothing and that nobody was aware of. When I took a patent myself, I did not [even] know that

40 *Journal officiel de la République française. Lois et décrets*, 14 juillet 1951, p. 7656. The translation is mine (GGB).
41 *Idem.*

> Volkringer existed."[42]

However this judgment seems very severe when comparing the situation of the CNRS with other research organizations in the 1950s. In 1957, the Ministry of Trade and Industry planned to create a new organization to manage patents for governmental services and public companies.[43] This project was the opportunity to inquire about 'public patents' and the CNRS was one of the first governmental agencies to hold them.

[Insert Table 3 here]

Conclusion

The use of patents by scientists lies at the heart of dynamics emerging in the 1930s in the field of nuclear physics. Patent management in scientific organizations met several needs: enforcing the rights of scientists involved with industrial partners, providing income for science, and allowing scientific exchanges at the international level. Patent management was also a way to practice science, as expressed very clearly by Frédéric Joliot in 1947:

> "I have to say something with a little flashback. In 1939–1940, an important issue that was discussed and, I would say, that made it difficult to obtain a solution, is the fact that it was considered that spending a lot of money for patents, would be very expensive ... Indeed I believe that these patents have cost a total of about 3 to 4 million, it's obviously a heavy load for the CNRS these three million [for] patents ... We can afford this cost because we think it is worth much more, even if it does not bring in a penny ... or a franc ... I mean if it does not put a franc on the table, but it allows [us] to discuss, [to] have advantages for foreign exchange that do not represent a direct financial income but [sic] material benefits that can be quantified and that are still important."[44]

The French organization of scientific patenting clearly depended on how French research was structured, but it also depended on the decisions made by those involved in the new organization for research and patenting. In a sense, Langevin, Perrin, Joliot and many

42 *Cahiers pour l'histoire du CNRS*, 6–1989, online : http://www.histcnrs.fr/cahiers-cnrs/origines-cnrs-1.html, consulted on 15 September 2015.

43 AN 19760359/79, Ministry of Trade and Commerce to Ministry of National Education, 12 December 1957.

44 AN 19860369.

others understood the importance of patents first-hand and how they could be used in the service of science and did not forget to take this into account when setting up the new organization dedicated to French science.

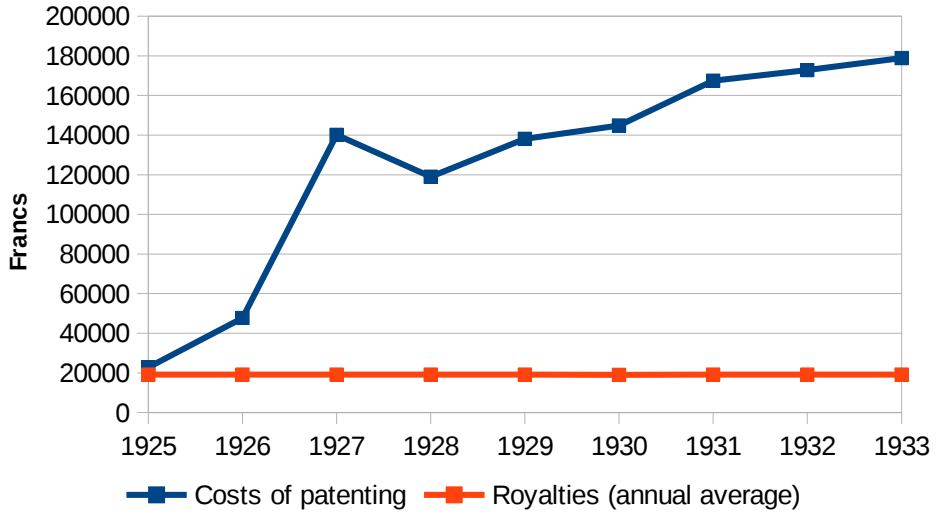
However the centralization of scientific patenting by the CNRS may have had a particular consequence: it may have prevented other actors, such as universities, from developing their own patent culture and patenting capacity. In the universities, scholars could choose between applying to the CNRS or filing for a patent themselves. This is probably why the first patent was only submitted by a French university in 1965.[45] Patent management in French research organizations probably depends on this path-dependency which has to be considered for public policy.

45 French patent 1 454 551, faculté des sciences de Besançon, Laboratoire de sciences appliquées.

Country	Patents granted by the Office from its creation	Patents still available in 1934
France	162	107
Belgium	122	15
Germany	57	14
UK	35	15
USA	25	18
Italy	17	3
Luxembourg	15	12
Switzerland	14	2
Austria	10	0
Spain	8	2
Czechoslovakia	6	1
Canada	4	4
Sweden	3	
Poland	1	
Netherlands	1	
Tunisia	1	1
Morocco	1	1
Japan	1	0
Egypt	1	1
Total	484	196

Table 1: Number of patents granted to the ONRSII from its creation to 1934 (Source: Calan's report, AN 398 AP 24.)

Figure 1



Date of Application	Title of the patent	Number	Applicant
1 May 1939	Procédé de production d'énergie	976 541	Caisse nationale des recherches scientifiques
2 May 1939	Procédé de stabilisation d'un dispositif producteur d'énergie	976 542	Caisse nationale des recherches scientifiques
4 May 1939	Perfectionnements aux charges explosives	971 324	Caisse nationale des recherches scientifiques
30 April 1940	Perfectionnements aux dispositifs producteurs d'énergie	971 324	Halban, Joliot, Kowarski
1 May 1940	Perfectionnements aux dispositifs producteurs d'énergie	971 386	Halban, Joliot, Kowarski

Table 2: French patents relating to nuclear energy (1939–1940)

Institution	Year of creation	Number of French patents	Number of Foreign patents	Total	Annual average
CEA	1945	350	1250	1600	123
CNRS	1939	768	1139	1907	100
CNET	1944	648	200	848	60
EDF (*)	1946	168	194	362	30
GDF (*)	1946	87	43	130	11
SNCF (*)	1937	139	27	166	9

INRA	1946	31	14	45	4
RATP (*)	1948	21	12	33	3
IRCHA		15	0	15	

Table 3: Patents granted to French research agencies from their creation until 1958. (*) Public companies with a research activity.[46]

46 AN 19760359/79.