France and Nuclear Deterrence
A Spirit of Resistance

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France and Nuclear Deterrence – A Spirit of Resistance

Preface

Florence Parly[*]

It is healthy and necessary to think and talk about France's nuclear deterrence. The conference *Résistance et Dissuasion* (Resistance and Deterrence), held on 5 October 2017 in Paris, once again showed the benefits of doing so, by providing new and useful insights into the origins of nuclear deterrence.

First, the conference placed nuclear deterrence in its historical context. I firmly believe in the value of history. I am convinced that we are unable to interpret our decisions, strategies and misgivings without first having an understanding of the meaning and importance of each event.

How can we grasp how important nuclear deterrence still is today without looking back in time, without knowing about the Battle for Heavy Water (*La Bataille de l'eau lourde*) of February and March 1940?

Retrospection is key to discussing the spirit of resistance. This means bringing new meaning to France's extraordinary atomic journey and the unique nature of our nuclear deterrence.

Identifying the links between Resistance and deterrence also means pinpointing the factors that led those fighting for France's freedom to choose nuclear defence and deterrence so as to uphold the country's sovereignty.

This issue is still relevant. In a time of apparent peace, where conflicts seem a distant memory and our approaches are so different, we must share what we know. We must constantly explain nuclear deterrence and its central role in our independence and our ability to speak and be heard.

As the French President stated on 13 July 2017, nuclear deterrence is "the keystone of our security and the guarantee of our vital interests". The French have understood this and believe in it.

[*] French Minister for the Armed Forces.

However, we must not take this understanding for granted, but must continue to commemorate, share experience and engage in dialogue. This was one of the aims achieved during this engaging conference, the proceedings of which have been published. These actions cultivate our spirit of defence, and underline the basic rules of this "strategic grammar", which we have at times forgotten since the end of the Cold War.

The proceedings from the 2017 conference provide a reminder of the fundamental principles of this "grammar". They remind us of the pioneering role of France in the discovery of nuclear energy. Henri Becquerel, Pierre and Marie Curie, Frédéric Joliot and Irène Curie are names that remain intimately associated with the discovery and birth of nuclear science. They also point to the fact that it was WWII that gave full meaning to the French nuclear adventure and its necessity.

This history cannot be told without mentioning the man who played a great federating role: General de Gaulle. He pushed for "Free France nuclear physicists" to work with British scientists. He refused to conceive that France would once again become a victim of tyranny and oppression, and staunchly believed that our country should not depend on its British and American allies for defence.

The Cold War confirmed these priorities and added a new factor: possessing nuclear weapons became necessary to ensure peace and stability, which meant having a strike force to avoid becoming the target of a nuclear attack.

Today, with many nations clearly modernising their deterrence capabilities and North Korea developing its own nuclear programme, nuclear deterrence is more relevant than ever.

I believe that everyone is aware of this. One of the major aspects that stands out in the proceedings from the conference is the remarkable continuity of French nuclear deterrence. It shows no political colours or affiliation, and has been affirmed by a whole series of governments. Every French leader has pursued the common goal of protecting the country's strategic autonomy and independence. Deterrence has shown the great accomplishments a country can achieve when it stands unified behind a common goal and throws all its efforts into it. Deterrence allows us to be free.

We are the heirs of history, and are aware of the challenges and uncertainties of today's world. The threats to France are becoming more diverse, violent and destructive, and we need to remain vigilant.

This is why, even before his election, the French President declared that our nuclear deterrence strategy must be upheld, along with its complementary sea-based and airborne forces. The President also noted the need to update these components. This stance is reflected in the military spending included in the 2019-2025 Military Planning Act. It is critical to the credibility of our deterrence force.

This includes political credibility, which hinges on unfailing national commitment. It is represented by the French President, who has the ultimate responsibility, and by Parliament,

whose vigilance and support are key. It also includes operational credibility, with complementary airborne and sea-based forces that provide the President with various options and resources. This operational credibility also protects his decision-making autonomy and ensures that suitable means are engaged.

Finally, it encompasses scientific, technological and industrial credibility. The atomic adventure is an outstanding French success, and, since nuclear weapons testing was stopped in 1996, it has led to significant technical achievements and expanded the frontiers of innovation. An entire ecosystem has emerged and developed around nuclear deterrence. It plays a key role in our defence economy, which we need to promote and protect.

However this innovation, research and high standard would not be possible without the people who contribute to them. Civilians and military personnel are the faces and strength behind our deterrence. They work relentlessly towards this "*oeuvre commune*" (joint engagement) while providing operational credibility and readiness. I have had the opportunity to meet and talk with them to understand their demanding work at Île Longue, aboard *Le Terrible* nuclear submarine launcher, on the Istres Air Base and in the *Commissariat à l'énergie atomique* (French Alternative Energies and Atomic Energy Commission, CEA) Military Applications Division.

Associating the words "resistance" and "deterrence" was a bold decision – as was bringing together so many players to work together on exploring the historical roots of our deterrence strategy. I would like to thank all the people who organised, participated in and shaped the conference that has led to this very interesting book.

They are the ones who provoke reflection around nuclear deterrence and continue to raise awareness about what is and remains at the very heart of our sovereignty.

Foreword

Bruno Racine[*]

On 5 October 2017, I had the pleasure of giving the opening speech at the *Résistance et Dissuasion* (Resistance and Deterrence) conference organised by the French Foundation for Strategic Research (FRS – *Fondation pour la Recherche Stratégique*) and the French Alternative Energies and Atomic Energy Commission (CEA). It was held at my former place of work, the French National Library (BNF), with its accompanying, and now travelling, exhibition. The event was held under the patronage of the French President.

It received support from numerous partners whom I would like to thank: the *Fondation Charles de Gaulle*, the *Fondation de la France Libre*, the *Musée Curie*, the French Ministry of Defence history department, the Ministry of the Defence institute of communication and audiovisual production (*Établissement de communication et de production audiovisuelle de la Défense*), the Diplomatic Archives, *École normale supérieure de la rue d'Ulm* and the history journal, *L'Histoire*.

I would first like to say something about the title. Resistance needs to be understood in the broad sense, not just as the French Resistance but also, of course, Free France in general and even beyond – the spirit of resistance.

The history behind what would become French nuclear deterrence is not widely known and has surely not been studied to its full extent, despite the work by Bertrand Goldschmidt, who was a major player. One of the outcomes of a publication like this one is hopefully to incite new research, which explains the participation of several heritage and research institutions in the 2017 conference.

The general overview of this book perfectly outlines the range of factors behind the selection of this theme. It particularly shows the close link that needs to be made between Free France in the United Kingdom, to which scientists like Jules Guéron made their way in the days following de Gaulle's appeal for resistance of 18 June, and the birth of French nuclear policy, particularly in its relations with our British and American allies, before it became a reality in 1945 with the establishment of the CEA by General de Gaulle.

This book, like the conference, underscores the key role of the eminent General de Gaulle in this area during both the Liberation of France and his return to power, while placing him in a context with many other events, shining the light on lesser-known yet decisively influential figures.

[*] President of the *Fondation pour la Recherche Stratégique* (French Foundation for Strategic Research) (FRS) and former president of the French National Library (BNF).

This glimpse into the past is essential for better understanding the present. If you look past the politicians, scientists and engineers who participated in France's nuclear journey and focus more on the pioneering thinkers and theorists behind deterrence, it becomes clear that this original matrix is still significant. This applies not just for France and the United Kingdom but for the United States as well.

The great American deterrence theorists, Bernard Brodie, Albert Wohlstetter and Hermann Kahn, all share the fact that they never fought in a war and are second or third-generation Americans, unlike Henry Kissinger, who was forced to flee Nazi Germany in 1938. For them, the founding experience was that nuclear weapons were used once, far from American soil, and put an end to a war that otherwise could have led to hundreds of thousands of more deaths. All the fundamental questions that American doctrine attempted to resolve, from deterrence extended to allies to superiority in a potential nuclear war, are influenced by this, and are still relevant, as seen with the North Korean crisis.

On the flip side, for French deterrence thinkers, the central event, or should we say trauma, is the disaster of 1940. Generals Beaufre, Gallois and Raymond Aron joined the Free French Forces at one point or another, and I am sure that Lucien Poirier would have done the same if he had managed to escape. Sanctuarisation and the rejection of nuclear war are essential for those who experienced the invasion of France and its ensuing devastation. Deterrence has historically provided the answer to their aspirations. It is up to later generations to constantly update it to adapt to the threat.

And now a final word on the spirit of Resistance, which our country lacked so greatly at the time of the Munich Agreement in particular. General Gallois recalls that as a young aviation officer, he and his comrades had to sleep next to their aircraft to prevent sabotage. The book's title underlines the fact that beyond technical or operational data, deterrence is linked to a state of mind which is threatened if the national community is divided. The decisive importance of national consensus must never be forgotten.

Introduction

Céline Jurgensen and Dominique Mongin[*]

Associating the terms "resistance" and "deterrence" with the Second World War, when French nuclear deterrence did not yet exist, might seem like a surprising thing to do. However, the origins of French nuclear deterrence date back to the conflict, as evidenced by the pioneering work of Frédéric Joliot and his team at the Collège de France, and the pivotal role played by the nuclear physicists of Free France (*France Libre*) throughout the war. Nuclear deterrence is a remarkable example of the lesson that General de Gaulle drew from the war: that France's existence as a free country is not a given and must always be defended – and his successors have never called this legacy into question.

This context provided the background for the "*Résistance et Dissuasion – Des origines du programme nucléaire français à nos jours*" (Resistance and Deterrence – From the origins of France's nuclear programme to the present day), a conference organised by the French Foundation for Strategic Research (FRS) on 5 October 2017 under the patronage of the French President, held at the French National Library, with the support of the French Alternative Energies and Atomic Energy Commission (CEA), in partnership with the *Fondation Charles de Gaulle*, *Fondation de la France Libre*, the *Musée Curie*, *École normale supérieure ENS Ulm* (CIENS: Centre for Multidisciplinary Studies on Nuclear Defence and Strategy), the French Ministry of Defence history department, the Ministry of Defence institute of communication and audiovisual production (ECPAD), the Diplomatic Archives, and the history journal, *L'Histoire*. The conference brought together historians, practitioners, French deterrence experts and journalists to explore the links between the French Resistance and the birth of French nuclear deterrence. It also focused on continuity factors, in a historical, present-day and forward-looking approach. In view of the interest generated by these discussions, we felt it useful to publish the presentations of those who spoke at the conference and to ask for insights from other eminent specialists.

This book delves into France's unique nuclear deterrence history, with a threefold objective.

The first is to take a retrospective look at France's nuclear journey as explored through the little-known theme of the French Resistance and the atom. It retraces the actions of the many Resistance and Free French figures who took part in the atomic adventure from its beginnings.

The second aim is to draw links between the past and the present, and between the "French Resistance spirit" and the commitment to France's independence, now incarnated in the country's deterrence strategy. In 2018, France celebrated the 60th anniversary of both the Fifth Republic and the CEA Military Applications Division. The fact that these two anniversaries coincided is not surprising, as the French collective memory associates nuclear deterrence

[*] Céline Jurgensen is a career diplomat. Dominique Mongin is a historian.

with General de Gaulle and his fight for national sovereignty. Today, nuclear deterrence is still for France "the keystone of our security and the guarantee of our vital interests", as stated by President Emmanuel Macron on 13 July 2017. It enables France to protect its freedom to act and make its own decisions in all circumstances, and is a key element of its credibility on the international stage.

The third aim of this book is to raise awareness about nuclear deterrence issues with a broad audience. In a context of high strategic uncertainty and conflict, as evidenced in France's 2017 strategic defence and national security review, now is the time to collectively re-examine our basic strategic principles. These informative efforts are important as France has made major decisions under the 2019-2025 Military Planning Act, which will have repercussions for several generations.

*

The book begins on the eve of the Second World War (WWII), when France is one of the international frontrunners in nuclear energy, the emerging new energy source. Renaud Huynh recalls that the work of Frédéric Joliot – who discovered artificial radioactivity with his wife, Irène Curie – and his team at the Collège de France played a pioneering role in the field. When war broke out, substances associated with potential atomic energy applications, such as uranium dioxide and heavy water, took on a new dimension and became much sought-after by the major powers. Dominique Mongin explores the first battle for heavy water in February/March 1940, which pitted France against Nazi Germany, in the greatest secrecy. At the Fall of France in June 1940, the world's entire stock of heavy water, which France had recovered, was smuggled to the United Kingdom by two members of Joliot's team, Hans Halban and Lew Kowarski, with the aim of continuing the research until then carried out in France. With the creation of the *Atomiciens de la France Libre* (Free France nuclear physicists) group, nuclear science became a major strategic factor in the French Resistance's position towards its British and American allies, and in preparing the post-war period and reconstruction of the country. Bruno Comer covers the rarely discussed episode of the (temporarily) shared destiny of heavy water and Belgian diamonds smuggled out of France in June 1940 aboard the British *SS Broompark.*

Robert Belot explains to what extent WWII played a decisive role in transforming French research and how researchers saw their mission, with the emergence of a geopolitical conscience about technical and scientific issues. Scientists became engaged in the war effort in many ways, either in the Resistance in occupied France or as part of Free France. Diane Dosso writes about Louis Rapkine, the scientific coordinator for Free France, renowned for his major role in using science to contribute to the Resistance.

In the aftermath of WWII, "Never again!" became the slogan of those who would set France on the path towards nuclear deterrence. Many contributors to this book evoke the Fall of France in June 1940 as a pivotal moment. France's acquisition of an independent nuclear deterrence force is therefore a direct legacy of WWII, both a reaction to one of the worst

military defeats ever experienced by the country, and the manifestation of the engagement of a handful of nuclear specialists within Free France.

The French nuclear journey continued when General de Gaulle established the Atomic Energy Commission (CEA) in October 1945. It goes without saying that the Resistance marked the early beginnings of the CEA, both in terms of its spirit and how it was run. Georges-Henri Soutou evokes the importance of the resistance culture in the launch of the French nuclear weapons programme in late 1954, underlining the expertise gained from clandestine research and the key role played throughout the 1950s by Pierre Guillaumat, a former member of the *Bureau central de renseignement et d'action* (BCRA), Free France's secret services. François Geleznikoff stresses that Pierre Guillaumat chose Albert Buchalet, the first director of military applications at the CEA, specifically because of his engagement in the Resistance. However, besides the illustrious case of Pierre Guillaumat, Patrick Boureille highlights the actions of all Free France members who were involved in the nuclear adventure.

In the aftermath of the war, the nuclear factor as a whole helped drive the reconstruction of France from an economic, political and strategic standpoint. In fact, it was the very essence of the first five-year atomic energy plan (1952–1957) implemented by Secretary of State Félix Gaillard. Jean Guisnel reveals that several other prime ministers (presidents of the Council of Ministers) under the Fourth Republic stand out for their clear dedication to the French nuclear defence programme, including Pierre Mendès France and Guy Mollet.

As the founder and first President of the Fifth Republic, General de Gaulle gave official status to the military programme launched under the previous regime. In the new President's eyes, nuclear deterrence was a key element for national sovereignty, as an essential way of protecting France's vital interests and claiming a place at the table with other international powers. "France's defence must be French," stated General de Gaulle on 3 November 1959 at *l'Ecole militaire*. Maurice Vaïsse underlines how important it was for the former leader of Free France that France be able to defend itself in its own way, refusing to subjugate itself to an alliance, and still be able to cooperate with other countries.

Since then, France's nuclear strategy has been based on the concept of "vital interests", as stated in the first White Paper on National Defence of 1972. This concept was not specifically defined, in order to avoid giving potential enemies clues on how to circumvent deterrence. According to Jacques Godfrain, this decisive choice to pursue a deterrence strategy that used innovation to protect national sovereignty is part of the imprint left by General de Gaulle on France's DNA.

However, as stated in the 2017 French Strategic Review, France does not develop its defence strategy completely on its own, even when it comes to the nuclear field. This logic, as exemplified in the "great debate" of the early 1960s between Raymond Aron and General Gallois (both members of the Resistance, who met in London in 1944 through the magazine *La France Libre*), still applies today. In Lucien Poirier's words,[1] "how do you reconcile the

[1] Lucien Poirier, *Des stratégies nucléaires*, Complexe [re-ed.] 1988, p. 311.

requirements and constraints of independence that our strategy regarding the atom requires, with those of our equally important contribution to the security of our neighbours and allies?" The efforts made by France on this subject over the last six decades demonstrate its desire to pursue strategic autonomy and sovereignty within an allied framework. This way of thinking provides the potential to take into account common interests with a close ally, as is the case with Europe's other nuclear power, the United Kingdom, since the Chequers statement,[2] which led to unprecedented nuclear cooperation, initiated in 2010 under the Lancaster House treaties. John Baylis takes a closer look at this Franco-British dimension by showing how current cooperation between the two countries stems from the important scientific collaboration developed during the Second Word War. Frédéric Gloriant looks back at this bilateral cooperation from a UK perspective, while underlining the critical role played by the Memorandum of September 1958, which General de Gaulle sent to his American and British counterparts, asserting the Fifth Republic's nuclear sovereignty. However, France's efforts to build a national deterrence force came up against strong opposition from its allies and particularly the Americans, notes Benoît d'Aboville, who explores the first diplomatic battles concerning nuclear deterrence, from 1954 to 1974, when NATO recognised the contribution of France's independent nuclear forces to the Alliance's global deterrence strategy.

According to Bruno Tertrais, this historical assessment shows that a "specific French nuclear identity" indeed exists. Throughout the Fifth Republic, France's nuclear defence policy has benefited from remarkable continuity at the highest level of government, and an ability to overcome partisan political divisions while constantly adapting to the perpetually evolving political environment. It has also been bolstered by the people to whom Admiral de Coriolis pays tribute, who have committed themselves and their skills to this "joint engagement", while ensuring the credibility and operational readiness of deterrence. According to Jean-Pierre Chevènement, ensuring that the French people accept and approve of this policy is essential. In this regard, he looks back at the development of consensus in France and reveals the underworkings of this complex political process with the election of François Mitterrand in 1981. Jean-Dominique Merchet, on the other hand, focuses on the scientific and technical challenges France had to overcome to equip itself with the nuclear weapons required to defend itself. This underlines the role nuclear deterrence has played in structuring and driving France's industrial and scientific ambitions.

Finally, General Henri Bentégeat draws from his extensive experience as a deterrence practitioner and evokes the nuclear weapons abolition campaign. He says that it takes "a lot of ignorance or lack of good faith" to overlook the fundamental role of deterrence in maintaining peace and stability since the end of the Second World War – "a strange peace, but peace all the same".[3] Preserving our strategic independence remains a fundamental objective of France's defence policy, but in an environment where globalisation and

[2] This Franco-British joint statement was made on 30 October 1995 after the summit between President Jacques Chirac and Prime Minister John Major. Mr Major stressed: "We do not see a situation... in which the interests of either France or the UK could be threatened, without the vital interests of the other also being threatened."

[3] General de Gaulle, quoted by André Malraux: *Les chênes qu'on abat*, ed. Gallimard, 1971, p. 203.

multilateral dependencies prevent nations from acting alone, the focus is placed more on European solidarity. Jean-Claude Mallet shares this opinion. For him, nuclear deterrence lets France preserve its strategic independence, and is an important asset in building the European project. Today, as in the past, it is a tool that gives France freedom in how it acts towards its potential adversaries and allies. In the face of reasserted power politics and the heightened resurgence of the nuclear threat, as some states pursue strategic intimidation policies, France must be capable of resisting coercion. The continuity of France's strategy is accurately reflected in the statement, "Deterrence is what ensures we can live in freedom".[4]

Today, nuclear deterrence remains the ultimate guarantee of France's security, protection and independence. France largely owes this continuity to the perpetuation of this "French spirit of resistance" and the commitment to the independence and freedom of the nation, resolutely expressed through nuclear deterrence and those who serve it on a daily basis.

[4] Speech by François Hollande at Istres, 19 February, 2015.

Chapter 1: Nuclear Science, a Strategic Matter for France during WWII

1.1. Frédéric Joliot-Curie and the beginnings of atomic energy, 1900-1939

*Renaud Huynh**

Frédéric Joliot-Curie is one of the great scientists of the 20th century through his physics and chemistry research, his pioneering role in organising science and research in France, and his battle for the peaceful use of atomic energy. The aim of this contribution is to recount his journey up to 1939, and to outline the transition from the "science of radioactivity" of the early 20th century to the civil and military nuclear era.

Jean Frédéric Joliot was born in Paris on 19 March 1900, the same year that Pierre and Marie Curie presented their report on "The New Radioactive Substances and the Rays They Emit" to the International Congress of Physics. Frédéric was twenty years younger than his oldest brother, as the last of six children born to Henri Joliot (1847-1921) and Émilie Roederer (1857-1946). His father was a cultured merchant and musician who enjoyed fishing and hunting, and passed on his love of nature and the arts to his son. Frédéric's mother came from a long line of Protestant, republican liberals from Alsace, and introduced him to the social values he would embrace throughout his life.[5]

Frédéric entered the Lycée Lakanal de Sceaux in 1910 and obtained his certificate of secondary studies in July 1915. He remained there another two years to study for the first part of his *baccalauréat*, which he obtained in June 1916. He then enrolled at École Lavoisier to prepare for the entrance exam into the *École de physique et chimie industrielles de la ville de Paris* (ESPCI – Paris School of Industrial Physics and Chemistry), which he passed in 1919. Joliot joined the 39th class of 1920, with Pierre Biquard, André Langevin, André Lazard, Henri Le Boiteux, Jacques Parrot and Jean-Jacques Trillat. The group of friends remained close long after they had completed their studies. His friend Pierre Biquard wrote that it was at this time that Frédéric Joliot began taking a strong interest in chemistry, to the point of transforming the family home into an experimental laboratory.[6] During his three years at "PC"[7] he developed an admiration for Paul Langevin, whom the students called *le Patron* ("the Boss"). His talents as an experimenter also drew attention during this period. Joliot graduated at the top of his physics class in 1923. Paul Langevin soon became a mentor for Frédéric, perhaps due to several things they shared in common (social background, École Lavoisier, ESPCI, etc). Langevin of course had a scientific influence on Frédéric, but he also had an impact on his

* Director of the *Musée Curie* historical museum.

[5] For a complete biography of Frédéric Joliot-Curie, see: Michel Pinault, *Histoire de Joliot-Curie*, Odile Jacob, 2000.

[6] Pierre Biquard, *Frédéric Joliot-Curie et l'énergie atomique*, L'Harmattan, 2003, p. 20.

[7] Standard abbreviation used for ESPCI.

political and philosophical thinking. Like Langevin, Joliot firmly believed in the benefits of science and its contribution to human progress, and the need for scientific learning for all.[8]

After obtaining several deferments, Frédéric Joliot was forced to begin his compulsory military service in November 1923. During this period, he began reflecting on his future and looking into a career in scientific research. In November 1924, Paul Langevin organised an interview with Marie Curie at the laboratory she oversaw at the *Institut du Radium* in Paris. She arranged for him to be discharged three weeks before the end of his military service and hired him as a laboratory assistant. The following year, at the request of Curie ("*la Patronne*"), he completed the second part of his *baccalauréat* and enrolled in a science bachelor's degree, which he obtained in 1927. From 1925 to 1927, he continued his work as a laboratory assistant while working on his degree.

While working at the laboratory with scientists such as Fernand Holweck, the director of Research, and Irène Curie, the famous couple's eldest daughter, the young researcher took an interest in "imponderable chemistry", preparation techniques and the study of radioactive sources. He distinguished himself as a talented experimenter. He developed a close professional and personal relationship with Irene, who was known for being difficult to approach. They were married on 9 October 1926 in an intimate wedding. They would have two children, Hélène, born in 1927, and Pierre, born in 1932.

"We realised that we couldn't stand being apart. We had very different personalities, but we complemented each other. In work and in life, the right associations are not made of identical personalities but ones that are complementary,"[9] said Joliot about their relationship.

In addition to his job as a laboratory assistant, Frédéric Joliot began teaching at the *École d'électricité industrielle de la ville de Paris* in 1927. The same year, he obtained an education grant from the Edmond de Rothschild Foundation, which he kept until 1931. Finally, he was appointed by decree as director of Research for the *Caisse Nationale des Sciences* (National Fund for Scientific Research) on 1 October 1931.

On 1 October 1932, Irène Joliot-Curie was appointed Head of Research. Her husband immediately replaced her as assistant of the radioactivity laboratory. He was officially appointed to the position on 1 January 1933 and maintained this role until early 1935.

Frédéric Joliot had his scientific research on the electrolytic deposition of radio-elements published for the first time in May 1927. In 1930, he brilliantly defended his doctoral thesis on "the study of the electrochemistry of radio-elements" before a doctoral panel including Georges Urbain, Jean Perrin and André Debierne.

At the *Institut du Radium*, he mastered the use of the ionisation chamber and Wilson Cloud Chamber, which he improved, and would later be instrumental in providing physical proof of

[8] For example, see "Quelques réflexions sur la valeur humaine de la science", in Frédéric Joliot-Curie, *Textes choisis*, Éditions sociales, 1959.

[9] Quoted by Michel Rouzé, *Frédéric Joliot-Curie*, Les Éditeurs Français Réunis, 1950, p. 32.

the fission of uranium, in 1939. He also took an interest in the study of polonium alpha rays and preparing intense radiation sources.

Until 1932, Frédéric was published extensively for his own research (12 publications) and collaborations with other authors (8). He was even more productive between 1932 and 1935, with numerous publications that attest to his close collaboration with Irène Curie, and their prolific research.[10]

Their main subject during this period was the study of penetrating radiation excited by the alpha rays of light atoms. They went on to conduct research on neutrons and the production and properties of positive electrons, before discovering artificial radioactivity. For this discovery, Wolfang Gentner, a young German physicist and specialist in Geiger counters working at the Curie laboratory in 1933, contributed to the experiments of the couple to prove the existence of these new radioactive bodies created by transmutation.

While carrying out research on "transmutation electrons", Irène Curie and Frédéric Joliot showed that atomic nuclei irradiated by polonium alpha rays emit complex radiation, that could not be explained. They interpreted this result by assuming that, instead of a proton, a neutron and positive electron are emitted to give the same final nucleus. This hypothesis was discussed extensively at the Solvay Physics Conference in October 1933. A reasonable explanation was finally provided with the discovery of artificial radioactivity three months later.

Irène Curie and Frédéric Joliot managed to artificially produce radioisotopes that decayed following the same exponential law as natural radio-elements through the emission of a continuous spectrum of positive electrons. They chemically identified two new radioisotopes, nitrogen-13 and phosphorus-30P.

On 1 March 1935, Frédéric Joliot became a lecturer in physical chemistry and radioactivity at the Faculty of Science, replacing André Debierne, who had become director of the Curie Laboratory after the death of Marie Curie. In the same year, Irène and Frédéric Joliot-Curie received the Nobel Prize in Chemistry for their discovery of artificial radioactivity, in recognition of their synthesis of new radioactive elements.[11]

From that point on, the doors to a wide range of jobs and opportunities were opened to Frédéric Joliot, who would gradually become known as Frédéric Joliot-Curie. The press began covering the research of the "atomic couple", the discoverers of "artificial radium" and later the "atom smashers". On 1 December 1936, Frédéric Joliot was appointed as director of the new atomic synthesis laboratory, one of the first laboratories of the French National Centre for Scientific Research (CNRS – *Centre national de recherché scientifique*). He transformed the "Ampere Laboratory" at Ivry and equipped it with a Van de Graaff particle accelerator that

[10] They jointly published 25 papers during this three-year period. Between 1928 and 1934, six years of fruitful joint research led to over fifty publications and contributed to several discoveries, including the neutron in 1932, nuclear positron (1933) and artificial radioactivity in January 1934.

[11] "The Nobel Prize in Chemistry 1935", NobelPrize.org,

produced three million-volt charges (two columns of the device were placed on exhibit at the entrance to the *Palais de la Découverte* when it was inaugurated for the 1937 World's Fair).

On 1 January 1937, he was appointed as Professor of Nuclear Chemistry at the Collège de France.

In 1937, Joliot and his team began working on building and operating particle accelerators to study nuclear reactions and produce new artificial radio-elements. The first and largest particle accelerator of its time to be built in Western Europe was the Collège de France cyclotron.

As for Irène Joliot-Curie, after a brief stint as Undersecretary of State for Scientific Research, to which she was appointed in 1936 by the Front Populaire government led by Léon Blum, she pursued her research at the Curie Laboratory. In December 1938, based on her recent results on transuranium elements, Otto Hahn, Fritz Strassman and Lise Meitner discovered nuclear fission of uranium.

Frédéric Joliot quickly began experiments to provide physical proof of this nuclear fission.[12]

Joliot and his colleagues, including Hans Von Halban (1908-1964) and Lew Kowarski (1907-1979), were working on the conditions for creating a chain reaction.

Despite a letter from physicist Léo Szilard (1898-1964), dated 2 February 1939, asking Joliot to stop publishing the results of his research on uranium fission, Joliot and his team continued to publish until war was declared in September 1939.

Consequently, in 1939, on the eve of WWII, three patent applications signed by Halban, Joliot, Kowarski and Perrin[13] were filed on the production of nuclear energy on behalf of the CNRS:[14] "*dispositif de production d'énergie"* (energy production device – 1 May 1939), "*procédé de stabilisation d'un dispositif producteur d'énergie"* (stabilisation process for an energy production device – 2 May 1939) and "*perfectionnements aux charges explosives*" (improvements to explosive charges – 4 May 1939).

The first patent describes potential fuels, moderators and the technical principles of nuclear energy production (including the use of radio-elements, industrial by-products). The second concerned the absorption of neutrons to stabilise a chain reaction, and the third addressed the principle of critical mass and nuclear explosions.

A final report was prepared by Joliot, Halban and Kowarski in 1939 on the possibility of producing unlimited nuclear chain reactions in a medium containing uranium ("*sur la possibilité de produire dans un milieu uranifère des réactions nucléaires en chaine illimitée*").

[12] Frédéric Joliot et al., "Preuve expérimentale de la rupture explosive des noyaux d'uranium et de thorium sous l'action des neutrons", *Comptes rendus des séances de l'Académie des Sciences, 30 January 1939*, vol. 208, p. 341.

[13] Later, two other patent applications were submitted (without Perrin), one on 30 April 1940, "*Perfectionnement aux dispositifs producteurs d'énergie*" (Improvement of energy production devices), and the other on 1 May 1940, "*Perfectionnements apportés aux dispositifs producteurs d'énergie"* (Improvements made to energy production devices).

[14] These patents were then transferred to the French Atomic Energy Commission (CEA).

The report, dated 30 October 1939, was sent to the *Académie des Sciences* in a sealed envelope, but was not opened until 18 August 1948.

It is therefore clear that, in the autumn of 1939, in the early days of the war, a frantic effort was being made to harness the energy of the atomic nucleus.

The year 1939 was thus a turning point, marking a shift from the science of radioactivity to nuclear science. It was also the year when France was drawn into a new type of war.

1.2. Nuclear military issues for France during WWII

Dominique Mongin[*]

When the birth of French nuclear deterrence is discussed, the Second World War is rarely brought into the picture. Similarly, when historians talk about the conflict, they rarely mention France's involvement in nuclear research.[15] And yet, the "nuclear physicists of Free France" played a significant role throughout the war, so that research could continue in a field where France was at the cutting edge in the 1930s. The patents filed in May 1939 by the Joliot team were of key importance to the pursuit of this research in France during the "Phoney War", and later in exile in an allied framework.

Jacques Allier, the young banker tasked with recovering the world stock of heavy water in Norway in February/March 1940 and who was therefore in close contact with Frédéric Joliot, revealed to the newspaper *La Libération* that Joliot "was driven by the events of September 1939 to focus his research less on the use of radio-elements to produce energy, of interest to peace-time industry, and more on developing a war application that would utilise the quick release of subatomic energy, with effects that would infinitely surpass those of the most powerful explosives".[16] After the war, the first Activity Report of the Atomic Energy Commission (CEA) explained that France's entry into WWII did not put a stop to nuclear research as the Minister of Armaments had "recognised the importance of continuing this research due to the attainable potential of producing extremely powerful explosive charges".[17]

From a strategic standpoint, it is important to put the third patent filed in May 1939, which introduced the principle of the nuclear bomb, into perspective with the military context of the time. Four months after the patent was filed, France joined the war against Germany. On the eve before France declared war (3 September 1939), Prime Minister Édouard Daladier emphasised France's commitment to fight Nazi Germany if it did not withdraw from Poland, underlining France's honour and "the protection of its vital interests".[18] At the time, Joliot and his team's research was mainly focused on slow neutrons and ways of generating a controlled

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[15] Initial work in this field was performed by the French nuclear weapons history research group (*Groupe d'études français d'histoire de l'armement nucléaire* – GREFHAN). Created in 1986 and chaired by Professor Maurice Vaïse, GREFHAN worked for ten years to compare perspectives between historians and prominent nuclear deterrence figures. For example, Bertrand Goldschmidt, one of Free France's nuclear scientists, who is mentioned repeatedly in this book, contributed to the group's research. This is the context in which I evoked the key role of the networks involved in the Resistance movement in the birth of French nuclear weapons in my book, "*La bombe atomique française (1945-1958)"*, published by Bruylant/LGDJ in 1997.

[16] *Rapport de Jacques Allier sur l'affaire de l'eau lourde*, February 1945, p. 2; BNF/Musée Curie Archives, hereafter ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-15.

[17] "*Rapport d'activité du Commissariat à l'énergie atomique du 1er janvier 1946 au 31 décembre 1950"*, CEA, Imprimerie nationale, 1952, p. 11.

[18] Speech by Édouard Daladier before the National Assembly on 2 September 1939, published in *Le Petit Parisien* on 3 September 1939. In view of the pioneering work of the French on nuclear energy military applications, the idea of protecting France's vital interests takes on special meaning since it later became directly associated with the concept of nuclear deterrence (since the 1972 White Paper on Defence).

chain reaction in a nuclear reactor by using a "moderator"; in their case, the use of heavy water.[19] This need for heavy water led France to launch and win the first "battle for heavy water". Consequently, the state established itself as a strategist under the determination of two prime ministers (who were also in charge of national defence), Édouard Daladier and Paul Reynaud, and especially the Minister of Armaments, Raoul Dautry, who led support for the Joliot team. The Resistance movement, whose most emblematic figure was General de Gaulle, changed the way in which nuclear energy research could be continued, and the only possible way was to pursue it outside France. The unwavering determination of the leader of Free France enabled France to carry on its work in such a strategic field, with his eyes set on the political and economic recovery of the country once it was liberated.

1.2.1. French nuclear scientists and the "Phoney War"

Nobel Prize winner, Frédéric Joliot's, contributed strongly to the national defence efforts, as seen in his research in both the nuclear and conventional fields. As soon as the war broke out, he used his knowledge and expertise to help defend his country by contacting the Ministry of Armaments and offering to conduct research in a diverse range of fields. Besides research unrelated to nuclear science, but beyond the scope of the patents of May 1939, which, for reasons of secrecy, were not openly mentioned in a summary of research written by Joliot,[20] his research included: the study and production of radioactive ink for secret messages or signs of authenticity, the study of radioactive element applications for biological problems, remote detection of chemical weapons, etc. Joliot's archives show the extent to which he was actively engaged in the war effort.

From a political standpoint, Raoul Dautry, who had been the Minister of Armaments since 13 September 1939, played a key role in advancing and coordinating the research undertaken in this field. He threw himself into mobilising scientists, technicians and industrial experts. In his view, only individuals with scientific knowledge and a broad understanding of what was required could bring pure science and "clients" together. After Joliot met Dautry in October 1939, to ask him to recover a stock of industrial graphite[21] and talk about heavy water, they developed a close relationship based on mutual trust. At the same time, in October, one of the members of Joliot's team, Lew Kowarski, was getting on with conducting the experiment he had prepared with Francis Perrin, using a 90-centimetre fuel stack of uranium oxide.

[19] Heavy water, or deuterium oxide, is an isotopic form of ordinary water where one or two hydrogen atoms are replaced with deuterium, which is an isotope that is twice as heavy. It was discovered in 1931 by the American chemist Harold Urey. Two years later, the first sample of pure heavy water was isolated through electrolysis. The specific process used to collect drops of heavy water required a high amount of electrical power, largely available in Norway thanks to hydroelectricity. Heavy water was originally used in the medical field as an experimental biological tracer.

[20] Memo from Frédéric Joliot to Inspector General Desmaroux (Director of the Ministry of Armaments's Central Powders Laboratory), 25 September 1939; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[21] As part of the Joliot team's research to slow down neutrons during chain reactions, the idea was to recover an immediately available stock of 10 tonnes of industrial graphite. Raoul Dautry did what was needed, which allowed an experiment to be carried out in Grenoble in December 1939. However, the experiment was a failure due to the graphite having an impurity level that was too high. See Vladimir Halpérin, *Raoul Dautry*, Fayard, 1997, p. 151.

However, the desired result to make a nuclear reactor work would have to be left for another time. They then considered using Uranium-235 to achieve fission, with the idea of using a low enrichment process. A letter from Joliot in early January 1940 corroborates this: "I plan to engage in research on the separation of heavy atom isotopes, which could interest the national Ministries of Defence and the Economy".[22] However, the problems encountered in taking this route caused them to confirm the prioritisation of heavy water.

The report that Frédéric Joliot gave to the Minister of Armaments on 13 February 1940 demonstrates the direction that French nuclear research would take, with the approval of the political authorities.[23] In the introduction of the report, which, according to concurring sources, was authored with his two main collaborators, Hans Halban and Lew Kowarski, Frédéric Joliot iterated the importance of the discovery of fission in January 1939, by putting it back into perspective. It asserted that, if more than one explosion were induced by a previous explosion, it would be enough for the chain of explosions to be "divergent",[24] i.e. self-propagating until complete burn-up of the mass. The three French physicians also highlighted the concrete discoveries made in the previous year. This included the physical proof of fission, the discovery of the release of neutrons through the fission process, the production of a uranium medium where the chain reaction is "*convergent",* meaning that the reaction takes place but quickly extinguishes on its own,[25] and the formulation of the conditions required to achieve a divergent chain. The central ideas to be adopted included pursuing heavy water as the best method. The isotope separation method seemed out of reach in the short term for France (not so much due to a lack of knowledge, but from an industrial standpoint). In these conditions, two types of materials would be needed to pursue the first option: metal uranium and heavy water. The Joliot team's report therefore marked the first step and provided a summary of the research achievements made up to that point by the French in the field of fission.

1.2.2. The first Battle for Heavy Water

In the autumn of 1939, Joliot had garnered the attention of the French authorities on the need to recover heavy water produced and stored in Norway in order to pursue French atomic research. This motivated Joliot to inform Raoul Dautry, in the above-mentioned report dated 13 February 1940, about the need to acquire a considerable stock as quickly as possible. At the same time, Joliot's team was looking into another potential moderator: carbon. This had formed the subject of an experiment to measure the rate of neutron absorption conducted

[22] Memo from Frédéric Joliot dated 2 January 1940, in response to a proposal made by J. Martelly; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[23] "*Rapport sur les produits chimiques nécessaires pour continuer les expériences sur la libération de l'énergie atomique de l'uranium"*, 13 February 1940; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14. The date of the report symbolically came exactly twenty years to the day before France's first nuclear test in the Sahara desert in Algeria.

[24] The term "divergence" has been widely used since the birth of the nuclear industry and refers to the release of nuclear energy through a chain reaction.

[25] A "convergent" reaction is a chain reaction that quickly dies out, as opposed to a "divergent" chain reaction, where neutrons endlessly multiply.

by Hans Halban in late November 1939, but it did not provide any conclusive findings. In the end, Lew Kowarski managed to convince Halban and Joliot to make deuterium oxide (or heavy water) the prime focus of their research, even if it was more difficult to obtain than graphite.[26]

The world's heavy water was produced almost exclusively by a Norwegian company, Norsk Hydro,[27] or the Norwegian Nitrogen and Hydroelectric Power Company, which was mainly owned by French investments: 67% of the company was owned by French capital, 25% by German and Swiss capital, and 8% by Norwegian, Swedish and other investments.[28] This explains the close ties between *Banque de Paris et des Pays-Bas* (Bank of Paris and the Netherlands) and the Norwegian company. France was all the more pressed to reach an agreement with Norsk Hydro since it was the only company in the world to produce heavy water in large quantities, with a stock of 185,55 litres. In addition, the French knew that Germany was conducting "extremely intense active"[29] research in order to use the product. Intelligence gathered in the winter of 1939/1940 also showed that the German authorities (via IG Farben, a company with a stake in Norsk Hydro) was looking to get its hands on the stock of heavy water in Norway and take over its later production.

Frédéric Joliot therefore closely followed the issue of heavy water, and spoke about it on 15 November 1939, in his laboratory at the CNRS, with Doctor Wallich, a member of the High Commissariat for the National Economy.[30] Soon after, the French scientist made a written request,[31] explaining that one foreign-produced product that could be used for national defence applications was heavy water, a rare commodity produced in Norway through electrolysis of ordinary water, at a lower cost than would be possible in France at the time. For Joliot, the priority was to find out how much heavy water was available in Norway, with the idea of recovering large quantities of it, at least 50 to 100 litres (200 litres had been mentioned at one point); hence the appeal to the services of the Ministry of the Economy. This came with a major warning from Joliot, that when they contacted the Norwegians, his name and those of his team should never be mentioned, due to the extremely sensitive nature of the subject. On 27 November, the Nobel Prize laureate was informed by telephone that the

[26] See Spencer Weart, *La grande aventure des atomistes français* (Scientists in Power. A history of the rise of nuclear science, weapons, and reactors in France), Fayard, 1980, p. 189.

[27] The initial goal of Norsk Hydro was to use hydroelectric power to produce nitrates for agriculture. Then, during WWII, the Norwegian company expanded its production to nitrated products for Allied explosives, hence the name's meaning in French, "Norwegian Nitrogen Company". In 1934, Norsk Hydro built the world's first industrial-scale heavy water production plant.

[28] According to a memo from Major Britt to General Groves on 6 October 1945 on Norwegian heavy water. ABNF/MC, ALSOS File (copies from the National Archives in Washington) in addition to the Fonds Joliot. From 1941, the Germans (IG Farben) and Swiss had a 48% stake in the company and the French (BPPB) 40%.

[29] Report by Jacques Allier on the French government's supply of the Norwegian Nitrogen Company's heavy water stock, November 1944; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-15.

[30] Just after the war broke out, Prime Minister Édouard Daladier closed the Ministry of National Economy and replaced it on 15 September 1939 with the High Commissariat for the National Economy (*Haut-commissariat à l'Économie nationale*), whose mission was to mobilise the entire economic fabric to serve the war effort.

[31] Memo from Frédéric Joliot to Dr Wallich, High Commissariat for the National Economy, 24 November 1939, ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

High Commissariat for the National Economy had sent a telegram to the French business attaché in Norway supporting his request.

As a sign of the urgency of his request, Frédéric Joliot felt it necessary to send a note to Daniel Serruys, the High Commissioner for the National Economy, on 8 December to draw his attention to heavy water once again.[32] Daniel Serruys was particularly interested in this matter since his son, Jean, who worked for a company that processed rare metals, had supplied Joliot with beryllium for his research on uranium. The High Commissioner was therefore well aware of the issue and knew about the advances made by the Joliot team.[33] In his memo dated 8 December, Joliot stressed that France would stand to gain from building a stock of a rare chemical product produced abroad, in the present and future interest of French scientific research, underlining that, in view of the current circumstances, they would not be certain to obtain more heavy water in the future. In early February 1940, Joliot sent another letter, cryptically explaining to the Powders Department in the Ministry of Defence that "heavy water is of key interest for conducting experiments which we have been working on for several months".[34] He reminded them that, for him, the priority was to build a large stock of heavy water, around 200 litres (which corresponded to Norsk Hydro's entire stock) and to prevent Germany from getting hold of the Norwegian company's stock. Raoul Dautry was particularly open to the arguments put forward by Joliot.

During a meeting held on 20 February 1940 with Frédéric Joliot and Jean Bichelonne[35] in attendance, the Minister of Armaments asked a young banker (initially working under the Powders Department and dispatched to the minister's technical office), Lieutenant Jacques Allier, to oversee a secret mission to recover the world's heavy water stock in Norway.[36] The minister knew that, prior to the war, Jacques Allier had represented the *Banque de Paris et des Pays-Bas* (Bank of Paris and the Netherlands) in relations with the Norwegian company, a majority stake of which was owned by the French bank, as seen earlier. Allier therefore had a longstanding relationship with the management team at the Norwegian company, and particularly its director-general, Axel Aubert. During the meeting on 20 February, Raoul Dautry, backed by Frédéric Joliot, informed his representative of the "exceptional importance"[37] of the matter. It became even more urgent when French secret services

[32] Memo from Frédéric Joliot to Daniel Serruys, 8 December 1939; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[33] On the recommendations of his son, Daniel Serruys had created a committee responsible for controlling stocks of rare metals, including uranium. See Spencer Weart, *La grande aventure des atomistes français* (*Scientists in Power. A history of the rise of nuclear science, weapons, and reactors in France*), Fayard, *op. cit.,* p. 187.

[34] Memo from Frédéric Joliot dated 2 February 1940 to the Chief Engineer, Head of Service D of the Department of Powders; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[35] Jean Bichelonne was a graduate of École Polytechnique and mathematician and Chief of Staff of the Ministry of Armaments.

[36] As a trustee at the *Banque de Paris et des Pays-Bas* (BPPB), Jacques Allier had alerted the Powders Department about Nazi Germany's interest in heavy water (*via* IG Farben) after a meeting he had on 19 January 1940 with a manager at Norsk Hydro. He then asked his contact not to supply Germany with heavy water, which the company's director, Axel Aubert, had already begun doing. A few days later, on 23 January, the president of BPPB, who was also vice-president of Norsk Hydro, confirmed Jacques Allier's request. See *Rapport de mission de Jacques Allier à Paul Reynaud et Raoul Dautry*, 16 March 1940; Archives nationales, AB/XIX/5194, Fonds Jacques Allier.

[37] Report by Jacques Allier on the heavy water affair, February 1945, *op. cit.,* p. 2.

provided intelligence that the Nazis wanted to recover the stock of heavy water in Norway and were planning to attack the Scandinavian countries (Norway was invaded on 9 April 1940). For the Ministry of Armaments, "in a time of war, it was clearly out of the question to give the enemy the slightest chance or run the risk of seeing it succeed thanks to the Norwegian product. We therefore had to get the heavy water to a safe place, regardless of what could happen on a scientific level".[38]

Raoul Dautry therefore asked Jacques Allier to carry out a mission to convince Norsk Hydro to give France as much heavy water as possible and reserve a large portion of its future production for France, despite Norway's status as a neutral state. Due to the absolute secrecy required to prepare the mission, extreme measures were taken, to the point of placing Hans Halban and Lew Kowarski under house arrest for the duration of the mission.[39] Although both of Joliot's colleagues were French (they had obtained French citizenship the year before), their former nationalities (Austrian and Russian respectively) worried Dautry.[40] On 26 February 1940, Dautry signed the mission order for Norway. The same day, Prime Minister (and Minister of War) Édouard Daladier did the same, leaving out the name of the destination. They cryptically asked Jacques Allier to go to Norway and recover as much heavy water (referred to as a "substance") with the help of several "War" intelligence secret service officers, including Captain Muller and Lieutenant Mossé, and a civilian, Knall Demars.[41] Allier expertly led the mission, narrowly escaping the team of German spies sent out to trail them, and getting their hands on the stock of Norsk Hydro heavy water.[42] Édouard Daladier had also included an additional note with the mission order,[43] leaving open the possibility for Germany to obtain

[38] *Ibid*., p. 3.

[39] In retrospect, this ostracising measure is shocking. Incidentally, as a sign of his absolute loyalty, Hans Halban had given Jacques Allier a metal tube containing cadmium before his departure, telling him that in the event of an enemy threat to the heavy water, once seized, the best way to make it unusable would be to pour the precious cadmium into it.

[40] Although it does not appear in Jacques Allier's mission report, according to Spencer Weart, Dautry had even asked Joliot if he could replace his two colleagues with people of "pure French descent", but the Nobel Prize winner outrightly refused. See Spencer Weart, *La grande aventure des atomistes français* (*Scientists in Power. A history of the rise of nuclear science, weapons, and reactors in France*), *op. cit*., p. 192.

[41] These last three names were given for the first time by Robert Aron in his book, *Grands dossiers de l'histoire contemporaine,* published in 1964 by Librairie Académique Perrin. In support of Jacques Allier's mission, these men demonstrated exemplary behaviour and their names have remained ingrained in the memory of the Allier family. Interview between the author and Violette Graff, Jacques Allier's daughter, on 19 December 2016. The pivotal role of Jacques Allier was revealed for the first time by Raoul Dautry during a radio broadcast on 11 August 1945 (following the atomic explosions on Hiroshima and Nagasaki), and published in the newspaper *Le Monde* on 15 August 1945.

[42] After the war, a Franco-Norwegian film directed by Jean Dréville and Titus Vibe-Muller in 1947, based on a scenario by Jean Marin, titled *Operation Swallow: The Battle for Heavy Water* (*La bataille de l'eau lourde),* was released to theatres the following year. The film, which is available on YouTube and Dailymotion, recounts the heavy water saga during the war. The first fifteen minutes of the film is of particular interest because of its actors… several major figures in the story play their own roles. The film is practically a documentary, with reconstitutions featuring personalities such as Raoul Dautry, Frédéric Joliot, Lew Kowarski and Jacques Allier. The famous French television show, "*Alain Decaux raconte,"* covered the battle for heavy water in an episode that aired in April 1978. However, it spent little time on the first act of the battle, in which Joliot and Dautry had played a key role, and did not even mention Allier's mission. In *Bon Voyage* (2003), director Jean-Paul Rappeneau gives a (highly) romanticised version of the exfiltration of France's heavy water in June 1940. Finally the BNP bank's website pays tribute to Jacques Allier and his role in the heavy water affair, under the title *Jacques Allier, banker in the 'secret war'* (https://history.bnpparibas/document/jacques-allier-banker-in-the-secret-war/).

[43] Raoul Dautry had himself initially prepared a mission order for Jacques Allier in which the name of the country of final destination was left blank, so that "Norway" could be added at the last moment. However, to convince people in high

part of the future production of heavy water from Norsk Hydro if necessary. The purpose was to avoid any reservations on the part of the Norwegian company's director concerning what he could have considered an unreasonable request from both a business and diplomatic perspective. However, Jacques Allier never ended up needing to put this argument forward since Norsk Hydro director-general Axel Aubert, was sympathetic to the French cause.

The Allier mission departed for Oslo on 28 February, travelling via Amsterdam, Malmö and Stockholm in order to cover their tracks and avoid detection by an enemy on the lookout.[44] On 4 March, Jacques Allier obtained confirmation from Axel Aubert that the Norwegian company would hand over its entire stock (185 litres) of heavy water. Allier then travelled to the RjUKan/Vemork plant, located 120km west of Oslo, also taking advantage of the opportunity to inquire about the anti-aircraft defence system set up around the plant. The plant director himself transported the heavy water in question in his own vehicle, in dangerous conditions (in the middle of the night, for five hours on an ice-slicked road). "A series of relays was then organized in Oslo so that any trace of the exchange would be lost",[45] Allier explained on his return. Afterwards, a formal agreement was made with Norsk Hydro on 9 March. In it, the company agreed to loan France its entire heavy water stock *for free*, with the possibility of purchasing it at a later time. The company also agreed to reserve all future production of heavy water at cost, provided it could set aside a small amount of its inventory for other countries if needed.

It was only at this point of negotiations that Jacques Allier felt it important to inform Axel Aubert of the ultimate civilian and *military* purpose for the heavy water France wanted to recover. Up until that point, the French representative had only told his contact about the potentially "*prodigious progress"* that the new source of energy could provide to the industrial field during peacetime. In reaction to the revelation, the director of the Norwegian company said, "Please tell your government that my company does not wish to receive a penny for the product you will be taking back until the victory of France. As for me, I know that if the experiment you have told me about is a success and if France has the misfortune of losing the war, I shall be shot for what I have done today. However, I take pride in taking that risk".[46] In return, Jacques Allier promised to protect the interests of Norsk Hydro in France, and particularly its brand image following a defamatory media campaign targeting its director.

Jacques Allier left Norway (a neutral country at the time) with the heavy water on 12 March 1940, after having to overcome problems with several French embassy employees in

positions at Norsk Hydro of the importance of the Allier mission, it appeared essential to have the mission order signed by France's chief executive.

[44] An interception of German radio communications detected a message mentioning Jacques Allier as a suspect to be intercepted, which suggests that there were "information leaks".

[45] Mission report upon return from Oslo, 16 March 1940, *op. cit*., p. 4.

[46] Cited in Jacques Allier's report on the heavy water affair, February 1945, *op. cit.,* p. 11. Axel Aubert did not have any trouble with the Germans for this feat. It should also be noted that the thank-you letter that the French government had written to Axel Aubert was never delivered to him as the officer tasked with delivering it to him (based in Denmark) was forced to destroy it when the Germans invaded Norway and Denmark on 9 April 1940.

Norway.[47] He also had to come up with a plan to keep the Germans off their tracks once again. He decided to split his team in two and fly to Edinburgh, while the other two members of his team, apparently heavily weighed down, made it seem as though they were taking a flight to Amsterdam (the Netherlands was also a neutral country at the time). However at the last moment, they hid their cargo in the plane on its way to Scotland. The diversion was a complete success, as Allier had reserved seats on both flights (the Oslo-Amsterdam flight was intercepted by the *Luftwaffe*). The Allier mission returned to France from 16 to 18 March and the stock of heavy water was stored under the greatest secrecy and protection, in the cellars of the Collège de France.[48] Frédéric Joliot received the 26 canisters of heavy water (8 litres each) and signed the corresponding delivery slips. France's highest state authorities were thus involved in the secret mission, including Raoul Dautry (responding to Frédéric Joliot's request), Édouard Daladier, Daniel Serruys and Paul Reynaud who, as the new prime minister, received Jacques Allier on 3 April 1940. The priority for France's political leaders was to win the war, and nuclear research seemed like an avenue that could give the country an edge over the enemy. Even at this time, the government considered building a nuclear weapon and testing it in the Sahara desert. Daniel Serruys even planned to ask the Ministry of Colonies to lease a 100km diameter piece of land for the first test.[49]

Meanwhile, the scientific authorities (namely Frédéric Joliot and Henri Laugier[50]) who had been prominently involved in the heavy water mission, by spearheading the recovery of the strategic stock, had different short-term priorities. Getting a nuclear reactor to work was first on the list for the Joliot team. However, it was the same team who, the previous year, had played a pioneering role by filing a patent that clearly spelled out the possibility of creating a nuclear bomb (this was one of the issues involved in negotiations with the Haut-Katanga Mining Union in 1939). As soon as they obtained the heavy water, Frédéric Joliot wanted to immediately continue his research. He therefore asked Jacques Allier to get Norsk Hydro to agree to an experiment at the RjUKan plant that would identify the coefficient at which thermal neutrons were absorbed by deuterium, in order to calculate the average lifespan of neutrons. The experiment would require an additional 200kg of heavy water, but at a low concentration level (just 70%, compared to the stock smuggled from Norway, which had a 99% + concentration level). This gave rise to a new French mission to Norway, led by one of the members of the secret service from Allier's previous team, who arrived in Oslo on 6 April 1940, just three days before Germany invaded Norway. The mission therefore had to be aborted – and the flasks of heavy water that were recovered had to be destroyed.

[47] See Captain Muller's report dated 16 March 1940, cited by Catherine Marchal: "*Quand la Bataille de l'eau lourde passait par Chevreuse*…", *Mémoire de Chevreuse*, no. 9, 2011.

[48] The Minister of Armaments had an anti-aircraft shelter specially built to protect the precious cargo, again demonstrating the strategic importance of the substance.

[49] See Spencer Weart, *La grande aventure des atomistes français* (Scientists in Power. A history of the rise of nuclear science, weapons, and reactors in France), Fayard, *op. cit*., p. 194.

[50] Henri Laugier was director of CNRS at the time.

1.2.3. The exfiltration of strategic nuclear-related substances

With the Nazi invasion into France gaining territory and the possibility of the government collapsing in France, the decision was made to hide the world stock of heavy water outside the capital. On 16 May 1940, Dautry telephoned Joliot to organise for the strategic substance to be moved out of the cellars of the Collège de France as quickly as possible. Later that day, Joliot assigned this task to chemist Henri Moureu, his colleague at the Nuclear Chemistry Laboratory.[51] Moureu was authorised to carry a weapon for the operation, and drove the cargo under the cover of darkness to Clermont-Ferrand, where the heavy water was stored in a branch of the Banque de France. The bank authorities did not want to keep such a strategic stock any longer than necessary, so Henri Moureu and physicist Jean-Jacques Trillat, a professor at the Besançon Faculty of Science, secretly transferred the precious cargo to a cell at Riom Prison, a location unlikely to become a military target and where secrecy could be maintained.

Then, on 16 June,[52] Armaments Minister Raoul Dautry (then stationed at Tours, the temporary seat of the government) telephoned Jacques Allier (at Mont-Dore, where the Ministry of Armaments' technical office had moved) to order the Joliot team to take the 26 canisters of heavy water to London, to continue French research in the United Kingdom. Allier decided to travel to Riom and retrieve the heavy water (with prisoners helping to load the canisters into his vehicle), taking it to Clermont-Ferrand, where he met Frédéric Joliot, Hans Halban and Lew Kowarski. There, he insisted, if not ordered, them to travel immediately to Bordeaux and embark for the UK. Frédéric Joliot was "extremely disheartened"[53] and expressed his desire to remain in France, whereas Halban and Kowarski (who had been released from house arrest after the Allier mission returned from Norway) were determined to cross the English Channel as quickly as possible. The fact that both scientists were of Jewish descent was a determining factor in their decision to leave France. The next day (17 June), the French nuclear physicists left Clermont-Ferrand for Bordeaux in several vehicles. Joliot was determined to do everything in his power to make the exfiltration mission a success, and accompanied his two colleagues as far as the British ship to be used for the operation, the *SS Broompark*, berthed in the port of Bordeaux. Before the pair embarked, Jean Bichelonne, chief of staff to Minister Dautry, handed them a signed mission order that was obviously antedated[54] to appear to precede the resignation of Prime Minister Paul Reynaud (16 June).

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[51] Henri Moureu: "*Un épisode peu connu de la Bataille de l'eau lourde – Clermont-Ferrand et la prison de Riom*", 6 December 1950; Archives nationales AB/XIX/5194, Fonds Jacques Allier.

[52] In his report, Jacques Allier is not absolutely certain of the date, but everything points to this being accurate.

[53] Report by Jacques Allier on the heavy water affair, February 1945, *op. cit.,* p. 19. However, CEA Activity Report 1946/1950 (*op. cit.,* p. 5) states that Halban and Kowarski received technical instructions from Frédéric Joliot before their departure. It can therefore be said that, although Joliot decided to stay behind in France, he fully supported the idea of having his team's research being continued in Allied territory with the precious stock of heavy water.

[54] The decision of Prime Minister Félix Gaillard dated 11 April 1958 establishing the plans for the first test explosion in the first quarter of 1960 was also antedated. See Chapter 4.

The handwritten mission order was essential for several reasons. It legitimised the continuation of French research on nuclear energy on Allied soil while emphasising the pioneering nature of the work; it showed the need to continue this research in a French framework, hence mention of Colonel Mayer[55] at the French embassy in London; it was the first example of international nuclear cooperation in history; and finally, it was one of the first acts of Resistance on the part of the French government. As Bertrand Goldschmidt, one of the Free France nuclear physicists, later wrote, the mission order of 16 June 1940 was "one of the most important documents in the history of nuclear energy. It had considerable consequences. During the war, much depended on its implementation and on the safeguarding of the heavy water: maintaining a French presence in the field; some of the directions taken by the British; the establishment of the first multinational scientific enterprise, in Canada; and, after the war, the successful startup of the French Atomic Energy Commission (CEA)".[56]

The two French scientists and the stock of heavy water were exfiltrated out of France thanks to Lord Suffolk, who had been the scientific liaison with the French government and been tasked by the British government at the Fall of France to facilitate the evacuation of French scholars who could contribute to the British war effort. He was helped in this by members of the British Special Intelligence Service (SIS).[57] On 18 June 1940, Halban and Kowarski left the port of Bordeaux aboard the *SS Broompark*, taking with them the world's stock of heavy water and reference documents relating to their research, with the mission of continuing the work in the UK.[58] Joliot asked them to undertake "a major experiment", which he had planned to carry out in Paris shortly before the evacuation.[59] On their arrival in the UK, the 26 canisters of heavy water were first stored at Wormwood Scrubs Prison, then transferred to Windsor Castle.[60] Henri Laugier, director of the CNRS, who had done his best to encourage and protect French nuclear research, was also on the same boat, but did not later cooperate with the British in this field.[61] The close ties between the British authorities and Dautry were

[55] It was René Mayer, the future prime minister who served under the Fourth Republic, but who did not play a direct role in French nuclear military activities.

[56] Bertrand Goldschmidt, *Pionniers de l'atome*, Stock, 1987, p. 104.

[57] One of its members was Ian Fleming, the future author of the James Bond novels, one of which tells the story of diamonds (*Diamonds are Forever*). Not only did the *SS Broompark* carry the world stock of heavy water, it also transported a large shipment of diamonds smuggled out of Belgium by a Belgian banker at the request of his government after the German invasion. Symbolically, the world heavy water stock and the shipment of diamonds received the same treatment aboard the *SS Broompark*, as detailed in a report drawn up at sea on 20 June 1940. It states that both shipments were packed into a raft, ready to be thrown overboard should the boat sink. The UK National Archives, AVIA 22/2288A and AVIA 22/3201. See the contribution by Bruno Comer later in this book.

[58] Surprisingly, General de Gaulle states in his War Memoirs (*Mémoires de guerre*) that, on 15 June 1940, he boarded the Milan, a destroyer that was to take him to Plymouth "alongside a mission with group of chemists led by General Lemoine whom Raoul Dautry, Minister of Armaments, had sent to take 'heavy water' ""to safety in England". See "*Mémoires de guerre"*, tome 1 (L'appel 1940/42), Plon, 1954, Presses Pocket, p. 79.

[59] See speech by Frédéric Joliot during the first meeting of the Atomic Energy Committee meeting chaired by Félix Gouin, on 19 March 1946; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-71.

[60] These details were provided by Margaret Gowing in 1965, in her book, *Dossier secret des relations atomiques entre alliés – 1939/1945*, *op. cit*., p. 38.

[61] See Chantal Morelle: "*Les années d'exil"* in "*Henri Laugier en son siècle"*, in *Cahiers pour l'histoire de la Recherche*, CNRS Éditions, 1995.

instrumental to this cooperation. Dautry asked Jacques Allier to travel to London to make contact with the scientific circles concerned, in particular with Dr Herbert Gough, director of Scientific Research at the Ministry of Supply. On 10 April 1940, Allier attended the first meeting of the MAUD Committee,[62] a new body formed in the UK to examine issues related to the release of nuclear energy. He advised the British about the race with Nazi Germany in the nuclear energy field.[63]

As for uranium oxide, the other strategic substance essential for the Joliot team to advance their research, the situation was different since there was sufficient stock available. The stock was obtained under safer conditions before the war broke out, thanks to the *Institut du Radium,* which had good relations with the *Union minière du Haut-Katanga* (UMHK, Mining Union of Upper Katanga), a Belgian company named after the province in the Belgian Congo, where was located the world's biggest known uranium stock at the time. These close ties dated back to the time of Marie Curie, and were further strengthened with the help of Raoul Dautry and Henri Laugier. Frédéric Joliot himself met with the directors of UMHK on 8 May 1939, just after the Collège de France team's secret patents had been filed. He met Edgar Sengier, deputy director of the company, and Gustave Lechien, director of the Radium Division. "It goes without saying that I was greatly impressed by these conversations and they strongly drew my attention to the importance of uranium as a potential material for bombs and the danger of this ore falling into the hands of a potential enemy",[64] Sengier would later say. Five days afterwards, the two directors of the Belgian company travelled to Paris to meet with Henri Laugier and the patent inventors of the Joliot team at the Collège de France, after a stop in London.[65]

A draft agreement was drawn up between the French and Belgians on 13 May 1939, including provisions for an exclusive contract to jointly use the applications of the first two French patents (regarding the principle of a reactor). The plan was to create a syndicate, but only after the success of two experiments. The first was to be conducted on five tonnes of uranium oxide and the second on a volume ten times greater.[66] The draft agreement even included a destruction clause, stating that if the stock was not destroyed it must be returned to UMHK. The clause can therefore be interpreted as having a dual anticipatory purpose: the performance of an experimental test and a runaway controlled chain reaction. Ten days after the agreement was signed (it was never formally ratified), UMHK sent five tonnes of uranium oxide to the Collège de France. Three more tonnes were shipped in March 1940. By that time,

[62] Report by Jacques Allier on the heavy water affair, February 1945, *op. cit*., p. 17. MAUD stands for Military Application of Uranium Disintegration.

[63] The handwritten minutes of the first meeting of the MAUD Committee, April 10, 1940, address this point as follows: "Lieutenant Allier made a statement as to the efforts which the Germans were believed to be making to obtain information about work done in France on the U bomb, and to obtain heavy water. He asked that all details should be kept strictly secret and not mentioned outside the meeting." The National Archives (UK), AB 1/347.

[64] According to a letter from Edgar Sengier to Hans Halban dated 1957, cited by Bertrand Goldschmidt in *Pionniers de l'atome*, *op. cit*., p. 80.

[65] Edouard Sengier met with Sir Henry Tizard, Scientific Advisor to the British government, on 10 May.

[66] See Bertrand Goldschmidt, *Pionniers de l'atome, op. cit*., p. 72.

France had therefore obtained eight tonnes of uranium oxide from the Belgian Congo, holding the world's largest laboratory stock at the time. As Bertrand Goldschmidt later wrote, UMHK gained significantly from the draft agreement as it would receive 50% of the royalties from the French patents (and from those ensuing) in exchange for transferring a small portion of its uranium stock (just over 1%). However, for France, the benefit was inestimable. With tonnes of uranium oxide, the French had an edge over other scientific teams across the world, which, until then, did not have access to the oxide. What is more, "if the war had not broken out, Joliot and his team would have had a good chance of being the first to build a nuclear reactor and the French patents would have been significantly enhanced from the hypothetical stage on paper, to a concrete achievement",[67] says Bertrand Goldschmidt. At the same time, the Belgian industrial firm had lent a gram of radium to the French scientists.[68]

The radium safeguarded in France had a number of potential uses in France during the Phoney War. In response to a question about the radium stock from the High Commissariat for the National Economy in December 1939, Frédéric Joliot answered that research in nuclear physics often required powerful sources of neutron radiation; hence, in his opinion, the need for one gram of radium for each of the neutron sources, in other words, two grams of radium to create two separate sources.[69] The following month, in January 1940, Joliot informed the High Commissariat for the National Economy that "certain research of interest for national defence required the use of high neutron sources obtained by carefully mixing radium salt with a glucinium metal powder".[70] These sources could be procured from the *Union Minière du Haut Katanga,* which knew how to prepare them. It is why Daniel Serruys, who, as seen earlier, was also interested in the matter of heavy water, gave Frédéric Joliot secret instructions in early 1940 to put pressure on UMHK to keep its huge stock of uranium away from the Germans.[71] French pressure proved to be extremely useful as UMHK shipped a large stock of uranium to the United States in the same year, which would end up being used for the Manhattan project.

In January 1940, the Ministry of Armaments (under the signature of a manager from the Department of Powders) asked the Nobel Prize laureate to assess information according to which Nazi Germany was looking to acquire the world's entire radium stock and the reasons why they would want to do this. Joliot answered immediately, telling the ministry that a manager from UMHK had confirmed the purchases but that the radium was to be used for medical purposes. The scientist also felt that other potential applications (x-ray studies of metal parts, gas ion source, neutron source, etc) were not "likely to quickly create decisive

[67] *Ibid*., p. 73.

[68] It was actually a mixture of radium and beryllium, which, at the time, was considered as the most efficient neutron source.

[69] Memo from Frédéric Joliot to Dr Wallich (High Commissariat for the National Economy), dated 8 December 1939; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[70] Memo from Frédéric Joliot to Dr Wallich, dated 22 January 1940; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[71] See Spencer Weart, *La grande aventure des atomistes français* (*Scientists in Power. A history of the rise of nuclear science, weapons, and reactors in France*), Fayard, *op. cit.*, p. 187.

offensive factors".[72] However, at the end of the month, the Department of Powders sent Joliot another request for assessment. It was worried that Germany's recent purchase of uranium salts was intended for detonators and to use the ionising effect of the radium salts. Joliot answered early the next month, saying that the use of radium salts in detonators was only possible with large quantities of radium, which seemed unlikely considering the scarcity and high cost of the substance. In general, the scientist downplayed the fears expressed, saying: "I would like to draw your attention to the fact that many radium applications have been put forward for unfounded commercial purposes, for example radioactive engine spark plugs, radioactive anti-freeze varnish for aircraft, pharmaceutical products, etc. As expected, results have been negative in most of the tests carried out in these cases".[73]

However, when France fell to the Germans, one of Frédéric Joliot's concerns was to safeguard France's stock of uranium oxide (8 tonnes) and uranium (1.5 grams).[74] They were first transferred to Clermont-Ferrand in *Banque de France* vaults at the same time as the heavy water. On 5 June 1940, Joliot wrote to the technical office of the Ministry of Armaments, asking it to turn over the radium stock to Hans Halban. As for the uranium stock obtained from the *Union Minière du Haut-Katanga*, it was to be smuggled out of France in the same month and stored in utmost secrecy in Morocco.[75] It was an act of resistance similar to the recovery of the stock of heavy water from Norway and its transfer to the United Kingdom. However, for logistical and practical reasons (the purposes were not the same), the shipments of the two strategic substances (185 litres of heavy water and 8 tonnes of uranium oxide) were managed differently, although the ultimate goal was to get them out of the enemy's reach as quickly as possible.

Physicist Serge Gorodetsky, working at the laboratory of Louis Leprince-Ringuet at the Ecole Polytechnique in Paris, was assigned the task of responding to the call by Frédéric Joliot to safeguard France's stock of uranium. Arriving in Bordeaux in mid-June 1940, bearing a mission order to travel to the United Kingdom, he was forced to take a freighter bound for Morocco, having failed to find passage to the British coast, and having accepted the responsibility of transferring 130 crates containing the strategic ore. On 17 June, the day before the shipment of heavy water, the cargo left France, reaching Morocco some ten days later via the Port of

[72] Memo from Frédéric Joliot dated 22 January 1940, in response to the memo of 15 January 1940 from the Minister of Armaments (signed by the Head of Service D of the Department of Powders); ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[73] Memo from Frédéric Joliot dated 2 February 1940, in response to the memo of 27 January 1940 from the Head of Service D of the Department of Powders), p. 2; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14.

[74] Memo from Frédéric Joliot dated 5 June 1940 to Lieutenant-Colonel Vallée, at the technical office of the Ministry of Armaments; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-14. Part of the radium stock (1 gram) had been personally loaned by the Union Minière du Haut-Katanga and the other (0.5 gram) had been provided to the Joliot-Curies by an American company.

[75] Revelations about this uranium stock hidden in Morocco were made in 1965 by American historian Lawrence Scheinman in *Atomic Energy Policy in France under the Fourth Republic* and Margaret Gowing, in her book *Dossier secret des relations atomiques entre alliés – 1939/1945*, then by Bertrand Goldschmidt in *Les rivalités atomiques*, published in 1967. In *Pionniers de l'atome*, published twenty years later, Bertrand Goldschmidt wrongly states that "absolute secrecy was maintained concerning the operation until I recounted these events in this book" (p. 77). What was new in his book was the details of the operation, with the names of the people involved.

Casablanca. There, the scientist Jean Perrin took charge of the operation. Then Jean Marçais, director of the Institut Scientifique Chérifien de Rabat, arranged for Serge Gorodetsky to meet Jacques Bondon, a young engineer from the Corps des Mines, who would play a key role in subsequent events. He had the shipment transferred by phosphate train to the mine of the Office Chérifien des Phosphates, located at Khouribga, in absolute secrecy. The existence of this stock was not revealed until early 1946, and the part played by these first resistance activists not until much later. It was the same scenario as for the heavy water affair. Once again, it was one of the first acts of resistance within the French government. Prior to the exfiltration of the strategic substances (uranium, radium and heavy water), Joliot's Collège de France team had decided to send a sealed letter to the Académie des Sciences on the progress of their research on chain reactions. The occupying German forces never got their hands on the letter, as it was not opened until after the war, in 1948.

As seen earlier, Frédéric Joliot refused to yield to Jacques Allier's order and decided to stay in France throughout the war for personal reasons, as he did not want to suddenly cut off ties with his family, laboratory, etc. However, he categorically refused to collaborate with the Nazis. In September, after returning to the Collège de France, he was interrogated about his scientific work by a German team whose nuclear specialist was no stranger to him, as it was the well-known specialist Wolfgang Gentner.[76] When asked about the whereabouts of the heavy water and uranium stock, Joliot punted the issue and remained evasive, leading them to believe that the heavy water had sunk with a ship off the coast of Bordeaux while being exfiltrated out of France. The most important thing for the French Nobel Prize winner was to be able to continue his research without collaborating with the occupying force, while paying special attention to how they would use his laboratory's cyclotron, which he was unable to keep away from the Germans. Joliot therefore stonewalled the Nazis when they interrogated him about the progress of his research on military applications for atomic energy, and did the same when the Vichy Regime tried to enlist him. It was Jean Bichelonne (the former chief of staff for Raoul Dautry, who, paradoxically, had signed the mission order of 16 June 1940), now State Secretary of Industrial Production under Marshal Pétain, who urgently asked him in 1943 to resume his research on fission, with no greater success than the German occupying forces. Meanwhile in 1941, Frédéric Joliot had joined the Resistance, becoming one of the leaders of the communist-leaning National Front (*Front National*) movement. However, it was not until 1942, in response to the execution of scientist Jacques Salomon (Paul Langevin's son-in-law) that Joliot joined the Communist Party. As for Jacques Allier, he stayed in France, having received orders to join the German Armistice Commission seated in Wiesbaden. However, he did not give in to the collaborating forces. In this capacity, he attended a cabinet meeting chaired by Marshal Pétain in August 1940, during which the heavy water issue was brought up. He was asked to give a report on the outcome of the strategic substance, with the audience unaware of his role in the operation. He again implied during the presentation that the convoy

[76] Gentner and Joliot had worked together and become friends at the Institut du Radium prior to the war. Gentner also expressed anti-Nazi sentiments to him, which can only have further confirmed Joliot's decision to remain in France.

that left Bordeaux with the precious cargo had sunk.[77] During the same meeting, Pierre Laval deplored the loss of what could have been sold to the Germans.

1.2.4. Shift work between France and the United Kingdom

As Halban and Kowarski's mission had been assigned by a minister of the Paul Reynaud government (Raoul Dautry), the two French scientists were never considered as fully-fledged members of Free France (even though they joined the movement in 1942/43), and were kept at a distance by General de Gaulle, who saw them as subordinate to the British effort.[78] Paradoxically, the two French scientists did not seek to join General de Gaulle's Free France as they were engaged in the British war effort. "They kept themselves apart from the French groups, such that there was no French representation, except for the fact that they were present",[79] noted Jules Guéron. The two scientists transferred the rights to the Collège de France patents of May 1939 with good intentions, but it became the focus of a controversy that continued until after the liberation of France, as Frédéric Joliot was not informed of the negotiations. Still, five scientists would be known as the "Free France nuclear physicists": Hans Halban, Lew Kowarski, Jules Guéron, Pierre Auger and Bertrand Goldschmidt. Although there were few of them, they greatly influenced British and Canadian research during the war.

In the first half of 1940, renewed British interest in military applications for atomic energy was sparked by two factors:

- In March 1940, the *memorandum written by two German scientists exiled in the UK, Otto Frisch and Rudolf Peierls,*[80] renewed the British authorities' interest in the new energy source. The two scientists stated that, in the future, it would be possible to create a superbomb in a small volume, with just one kilogramme of Uranium-235 (in reality, 60 kilos were needed for the atomic bomb dropped on Hiroshima), while emphasising the highly "radiative" consequences of such an explosion. It was the first time in history that a study revealed in such clear terms the destructive potential of a future atomic weapon.[81]
- *Jacques Allier's arrival in London in April 1940*, as a representative of the Ministry of Armaments, to inform the British about the progress of French research in atomic energy. This gave him the opportunity to meet British scientists John Cockcroft, George Thomson, and Marcus Oliphant. He also informed them of Nazi Germany interest in the military

[77] Report by Jacques Allier on the heavy water affair, February 1945, *op. cit*.

[78] The fact that General de Gaulle did not even mention the two scientists and their involvement in transferring the heavy water to the UK in his *War Memoirs*, and the way he was informed about the nuclear secret in Ottawa in July 1944, illustrate this stance. However, it is paradoxical because, during his press conference on 12 August 1945, de Gaulle mentioned the role of the French government in 1940 (to which he had "the honor of belonging") in providing the Allies with their expertise and resources in the field.

[79] Letter from Jules Guéron to Frédéric Joliot 12 January 1943; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-15.

[80] Rudolf Peierls, like Francis Perrin in France, took an early interest in the problem of the critical mass of the future weapon.

[81] See Margaret Gowing, *Dossier secret des relations atomiques entre alliés* – 1939-1945, Plon, 1965 (translation by Bertrand Goldschmidt), p. 31. However, from a technical standpoint, several conclusions in the memorandum in question proved to be false. The innovative nature of the study therefore mainly lay in the ability to foresee the principle of a new type of weapon that would be built at a later time. It was a similar scenario to the Joliot team's 3rd secret patent of May 1939.

applications of atomic energy and the race that had started. Allier was invited to attend the first meeting of the MAUD Committee,[82] formed in the UK to examine the uranium bomb. At the time, scientists in the UK felt that the study of fast neutrons undertaken at the Liverpool Laboratory was more pressing than the research on slow neutrons being conducted by the Joliot team.

Two months later, on 21 June 1940, Hans Halban and Lew Kowarski arrived in the United Kingdom with the precious heavy water. Paradoxically, when they arrived, the French scientists were initially faced with relative scepticism from the MAUD Committee regarding the value of their work in the context of the war. From the outset, the British preferred pursuing research into enriched uranium, with ongoing interest in gaseous diffusion. Nevertheless, Halban and Kowarski quickly presented a report to the British committee which underlined the interest of the natural uranium route for developing the bomb, even though the concept remained quite vague.[83] Their approach already anticipated the use of plutonium, which Glenn Seaborg and his team would not discover until December 1940 (its fissile capacity was confirmed in February 1941). Although the British authorities were reluctant to have foreign scientists join the MAUD Committee,[84] they referred Halban and Kowarski to the Cavendish Laboratory at the University of Cambridge, where they began their work in August 1940. Four months later, in December 1940, they demonstrated the possibility of a slow neutron chain reaction, using a mixture of uranium oxide and heavy water. It was the famous experiment that Frédéric Joliot had wanted to carry out in France if the country had not fallen to the Germans. It was the world's first conclusive experiment to be conducted in the field and it would take another four years for the German authorities to do the same.[85] The two French scientists paved the way to a relatively rapid use of atomic energy, while the general feeling among scientists of the time was that research could only reach fruition in the long term. Meanwhile, on the other side of the Atlantic, American teams were making great strides.

To assess the progress of British research, the MAUD Committee released a report written by James Chadwick on 15 July 1941, focusing on the use of uranium as a means for producing a new type of bomb and a new source of energy. In this field, heavy water was underlined, in reference to the precursor work of Halban and Kowarski.[86] It was considered that it would be

[82] The official British document, meant to be made public in August 1945, on the participation of the UK in the project that led to the development of the atomic bomb, stated that the aim of the MAUD Committee, created for this purpose, was as follows: "This committee was instructed to examine the whole problem, to co-ordinate work in progress and to report, as soon as possible, whether the possibilities of producing atomic bombs during this war, and their military effect, were sufficient to justify the necessary diversion of effort for this purpose" H.M. Treasury, *Statement relating to the atomic bomb*, *op. cit*., p. 15.

[83] See Margaret Gowing, *Dossier secret des relations atomiques entre alliés – 1939-1945* (Britain and Atomic Energy, 1939-1945), *op. cit*., p. 36.

[84] However, in October 1940, besides the two French scientists, the MAUD Committee employed other foreign intellectuals, including Otto Frisch, Rudolf Peierls, Joseph Rotblat, and Franz Simon, to name a few.

[85] See Jacques Allier: "The first atomic piles and the French effort", *The Atomic Scientists News*, March 1953, p. 228.

[86] The official British document of 1945 (H.M. Treasury, *Statements relating to the atomic bomb*, *op. cit.)* emphasised the contribution made by French nuclear physicists to the field in 1940: "Drs Halban and Kowarski were instructed by Professor Joliot to make every effort to get in England the necessary facilities to enable them to carry out with the co-operation of the British government, and in the joint interest of the Allies, a crucial experiment which had been planned in Paris and for which

possible to develop a uranium reactor provided the following problems could be resolved: stabilisation and control of chain reactions, extraction of large quantities of heat released in the machine without affecting the chain reaction, protection against radiation. A report prepared by Imperial Chemical Industries (ICI) stated that the Maud Committee and ICI Research Division believed that Halban's proposals were attainable and that reactions could be created and controlled.[87] The specific nature of the programme that the MAUD Committee presented in its report of July 1941 and the relative optimism it demonstrated explain why it was so influential with the American authorities, to such an extent that the historian of the British military nuclear programme, Margaret Gowing, wrote that "without the work of the MAUD Committee, its clear analysis, strong theory, practical programme and its sense of urgency, the Second World War could have ended without using the atomic bomb".[88] In addition, without the report that Jacques Allier gave in London in April 1940 and the mission order given to Hans Halban and Lew Kowarski in June 1940, the British work started via the MAUD Committee would never have been the same. This was actually pointed out in a document published by the British government at the end of WWII.[89] It should be noted that the Free France archives[90] and those of the *Fonds Joliot-Curie*[91] underscore the kindness shown by Sir John Anderson (while Chancellor of the Exchequer) to the French nuclear physicists during and after the war.

At the same time, the French patents regarding atomic energy were brought back to the forefront when the question was raised as to increasing cooperation between Halban and Kowarski and the British and American teams. On the British side, this did not raise any particular concerns. Four new patents were incidentally filed between the arrival of the two French scientists in the United Kingdom and April 1941. However, the same could not be said for relations with the United States, which did not acknowledge the contribution of the French patents until much later, at the end of the 1960s. For Free France, it was essential that relations with the British ally in the atomic field be balanced and respectful of each other's contributions, while preserving France's position at the end of the war. A three-pronged approach was therefore developed throughout the war:

- Gain recognition for the pioneering role of the French work in the field of atomic energy

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the 'heavy water' had been acquired. Facilities were provided at the Cavendish Laboratory, Cambridge, and, by December, 1940, they produced strong evidence that, in a system composed of uranium oxide (as actually used) or uranium metal with 'heavy water' as the slowing-down medium, a divergent slow neutron fission chain reaction would be realized if the system were of sufficient size"" (p. 17).

[87] See Margaret Gowing, *Dossier secret des relations atomiques entre alliés – 1939/1945*, *op. cit*., p. 246.

[88] *Ibid*. p. 60.

[89] This is the previously cited document, *Statement relating to the atomic bomb*, published by the British government in 1945. The booklet in question was so precious in the eyes of Jules Guéron (particularly because it highlights the role of the French nuclear physicists during the war, although it is incomplete) that his archives contain the handwritten phrase, "*Très précieux ; à garder ad vitam aeternam"* (*Very precious; to be kept* ad vitam aeternam), Historical Archives of the European Union, (hereafter AHUE), Fonds Jules Guéron, folder JG-7.

[90] In particular those consulted in the Fonds Jules Guéron at the Historical Archives of the European Union.

[91] See ABNF/MC, NAF 28161, Fonds Joliot-Curie.

- Gain recognition within the allied countries of French interests and rights in the field
- Prepare for research to be resumed in France after the war[92]

However, when Colonel Morin, director of Armaments for Free France, informed Sir John Anderson that Fighting France (*France Combattante*)[93] wanted the British government to formally commit to negotiate an agreement with the future French government after the war to recognise the role of France in the field of atomic energy applications, he met with a refusal. Despite this, the role of French representatives in the Tube Alloys programme[94] was outstanding in many respects. They oversaw research at the Cambridge Laboratory and then in Montreal (until 1944) and were not obligated to take on British citizenship[95] to be involved in the programme. However, this French exception mainly stemmed from the pioneering role of the Joliot team, which the British authorities recognised.[96] Nevertheless, the abovementioned three-pronged approach became more difficult for the Fighting France movement to defend when the Tube Alloys Laboratory was transferred to North America in 1943, at a time when the Manhattan Project (see below) was gaining momentum and relations between General de Gaulle and President Roosevelt were strained.

French research led the race to produce chain reactions, but would meld into the work of the British and Canadians during the Second World War, with five French scientists taking up the reins: Hans Halban and Lew Kowarski, who mainly worked on ways to slow down neutrons and therefore on a heavy water reactor; then in late 1941, Jules Guéron, followed by Pierre Auger and Bertrand Goldschmidt in 1942. Goldschmidt would be the only member of the French team to work for several months in the United States, in 1942/43, with the team of Glenn Seaborg, who discovered plutonium between 1940 and 1941.

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[92] In a memo sent to Wallace Akers, director of Tube Alloys on 5 November 1942, the director of Armaments for Free France, Captain J.A. Morin, explained France's position as follows: "We expressed our point of view concerning the French interests in the matter. With regard to the results of the research and the advantages, both military and industrial, to be derived therefrom, we consider that the ultimate position of France should be the same as that of Great Britain, the United States and Canada – it being understood that France would take her adequate share of the total expenditure incurred, the amount to be made up and settled in due course. You have agreed that there was good ground for this opinion in the fact that the work had been started in France, by French scientists, and that French scientists again, including some of the originators, were pursuing the research under the directorate of Tube Alloys and would continue to do so in Canada. […] We appreciate, on our own part that it is not possible to foreshadow all the development which may affect the position of the matter in the future, and readily admit that a document made at the present time can hardly be anything but a broad recognition of rights". Historical Archives of the European Union, Fonds Jules Guéron, folder JG-7.

[93] The expression "*France combattante"* (Fighting France) replaced "*France Libre"* (Free France) in July 1942 in order to emphasise the Resistance movement on French soil.

[94] The directorate of Tube Alloys replaced the MAUD Committee in October 1941, maintaining the same secrecy surrounding its real purpose. From then on, TA was the acronym used by the British and Americans when referring to the atomic bomb project.

[95] The nuclear physicists of Free France were not forced to take on British citizenship, which was generally imposed for other scholars in exile working in this sensitive sector. However, they had to sign a secrecy agreement to protect any secrets brought to their knowledge through their activities.

[96] In an undated memo likely from the first quarter of 1944, probably from the DSIR although unstated, the British authorities wrote the following: "The position of the French is exceptional partly because they did not wish to change their nationality, and partly because of the very special contribution made to the T.A. [Tube Alloys] project by the research already started by Joliot and by his action at the time when France was over-run". AHUE, Fonds Jules Guéron, folder JG-7.

1.2.5. Four-party allied relations in the nuclear field

The decision to transfer the Cambridge team's research, led by Halban, to Canada, was made, not without difficulty, by the British, Canadian and American authorities in the summer of 1942. They understood that "the world's first multinational scientific undertaking"[97] would have the advantage of having qualified labour resources in a promising sector available close to the American laboratories (particularly the Chicago laboratory). However, the Americans were strongly set against creating an integrated project in which the British, not to mention the French, would have access to all the data. Hans Halban had made it known that he preferred to pursue his research in Canada rather than in the United Kingdom, given the growing dependency of the British atomic efforts on the United States. He also wanted to be closer to raw materials and believed that he would be able to work more independently than in the UK. However, the plan to transfer to Canada came up against two problems. For the uranium reactor, the Americans preferred graphite as a moderator (due to the availability of the substance and its quick use) and there were no particle accelerators in Canada.

In the autumn of 1942, Halban began organising his team in Montreal, bringing together British, Canadian and French scientists with the goal of furthering studies on chain reactions with heavy water. The Montreal Laboratory was overseen by Chalmers Mackenzie, president of the Canadian National Research Council. It was steered by a policy committee and a scientific and technical committee. This committee was responsible for directing scientific research in Canada and was chaired by Hans Halban.

While the Canadian authorities provided their assistance to support Halban's laboratory research, it was not until March 1943 that the work of the new organisation was able to get under way in Montreal.[98] In addition, the composition of Halban's team in Canada created a number of tensions within the Cambridge team (Cavendish Laboratory). On the French side, the most divisive internal conflict pitted Halban against Kowarski as their diverging personalities and work methods led to a severe breakdown of their relationship.[99] As a result, Kowarski remained in Cambridge, finding himself "practically ostracised".[100] However, in defiance of Halban, several members of his team manifested their disapproval of his difficult personality and his desire to prevent Lew Kowarski from directing research.[101] Paradoxically,

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[97] See Bertrand Goldschmidt: "La France et la non-prolifération", *Relations internationales, printemps 1992*, p. 42.

[98] Under the direction of Hans Halban, the Montreal Laboratory included Canadian physicist George Laurence, Czech physicist Fritz Paneth, Italian physicist Bruno Pontecorvo (who defected to the USSR in 1950) and French physicists Pierre Auger, Bertrand Goldschmidt and Jules Guéron.

[99] "*Une sévère rupture*" – expression used by Hans Halban in a letter to Frédéric Joliot on 29 August 1944 in which he explained that the situation had been going on for nearly two years. ABNF/MC, NAF 28161, Fonds Joliot-Curie folder F-15.

[100] "*Pratiquement éliminé*" – Expression used by Jules Guéron in his letter to Frédéric Joliot on 12 January 1943, p. 4 ; Archives of the Bibliothèque nationale de France/Musée Curie, NAF 28161, Fonds Joliot-Curie folder F-15.

[101] This was expressed in a memorandum dated 6 January 1943 to Wallace Akers, director of Tube Alloys, and signed by eight scientists, including Jules Guéron. It states: "[…] Kowarski came to this country with more or less the same scientific standing as Halban with respect to the problems in question. Closer collaboration with both showed that Kowarski has the more profound and detailed knowledge of the subject and, in addition, his patience, clarity of thinking and quietness made him in effect the natural leader of the team. There can be no doubt that without Kowarski the work carried out in Cambridge would not have been possible and we fear it will also suffer considerably in Canada […]". The signatories added that they did not

the context of a transfer like this was not particularly beneficial for the British or Canadians, and even less so for the French. In a memorandum sent by James Conant[102] to the British and Canadian authorities in January 1943, the scope of future cooperation was incidentally limited. Scientific communication between the allies was considerably reduced and often severed to take into account the progress of American research. This included communication about Uranium-235 (under code name "element 25") and plutonium ("element 49"). Conant's memorandum therefore announced a clear cooling of relations between allies in the field of atomic research.[103]

However, one of the rare fields that was not affected by the new measure concerned the use of heavy water in chain reactions, but with a major warning nonetheless. It stated that "provided the British-Canadian group studies the scientific aspects of this matter in Montreal, full communication of scientific information on chain reactions shall be authorised between the groups in Montreal and Chicago. The Chicago group shall not be authorised to disclose information on the properties or production of element 49, including extraction methods or power reactor drawings".[104] And yet, one of the French nuclear physicists, Bertrand Goldschmidt, was working on these exact subjects, in direct contact with Glenn Seaborg, as seen above. In July 1942, Goldschmidt was sent to the Chicago Laboratory for four months on behalf of the Halban team in order to specialise in plutonium chemistry and methods for separating plutonium and fission products. He was therefore in close contact with Glenn Seaborg, head of the radioactive chemistry group at the laboratory. Goldschmidt returned there in February 1943 and once again had productive discussions with his counterparts, to such an extent that they gave him fission products and traces of plutonium. As Margaret Gowing noted, "these quantities were enough to perform some research and Goldschmidt was able to extract an extremely small quantity of plutonium – around 3 micrograms. It seemed that this amount would be better used to train specialists than to perform research, but in the end it was used for the first experiments on methods to separate plutonium from uranium".[105] At the same time, Pierre Auger travelled from Montreal to Chicago and also received a warm welcome. In fact, in December 1942, he was given the opportunity to observe in person the operation of an experimental nuclear reactor developed by Enrico Fermi, just three days after it began operating.

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want to suffer in the future from the behaviour of Halban: *"*In addition the team cannot visualise any effective collaboration with Halban if we have to expect similar attempts to put pressure on us whenever we offer criticism on scientific grounds […]". AHUE, Fonds Jules Guéron, folder JG-7.

[102] James Conant was president of the National Defence Research Committee and therefore an influential figure of the Manhattan Project*.*

[103] In late 1941, and for several months, the British authorities were reluctant to respond to the requests of the American authorities, who were aggressively seeking atomic information. Churchill did not respond to Roosevelt's October 1941 letter on the subject until two months later. It is true that at the time, the UK was the leader in the field.

[104] Margaret Gowing: "*Dossier secret des relations atomiques entre alliés – 1939-1945"* (Britain and Atomic Energy*,* 1939-1945), *op. cit*., p. 111.

[105] *Ibid*., ""p. 165. These details are important, especially since they were validated by Bertrand Goldschmidt himself, who translated Gowing's book.

All these interactions were therefore extremely useful to the research of the Montreal Laboratory, enabling the French nuclear physicists to acquire invaluable knowledge and experience. As a result, the Americans did not strictly comply with the Conant memorandum on several occasions. However, during the same period, political relations between the US and the UK were strained, and the British authorities had blocked a request by the US to invite Halban to meet with Fermi in New York concerning heavy water research. These deteriorated relations between the Americans and British were of no help to the Canadians, who wanted to avoid a fallout with the US. The French nuclear physicists were quickly brought into the race between the US and the UK in the nuclear field, which heightened the importance of the CNRS patents even more. As Jules Guéron noted in early 1943, "it was becoming increasingly ironic that France was excluded from the new talks. Halban and Kowarski made a serious mistake in not understanding early on that they were in no capacity to represent France, or if they did understand this, in not acting accordingly".[106] The issue of acknowledging the French patents was at the heart of this criticism. The situation calmed in August 1943, with the Quebec Agreements. However, transferring a team to Canada meant that a clear separation would be made between research on fast neutrons (henceforth conducted in the US) and research on slow neutrons. Some members of the British team (Chadwick, Oliphant, Frisch, Bretscher and Peierls) were assigned to the US in 1943 to share scientific experience on atomic bomb research. The French were excluded, just as they had been left out of political talks for the Quebec Agreements.

The French nuclear physicists of Free France who were part of the Halban team until 1944, worked almost exclusively on slow neutrons for the development of a nuclear reactor. They were not in direct contact with the Manhattan Project to develop a nuclear bomb and were not given direct access to research on isotope separation. However, Bertrand Goldschmidt was the only French person allowed to work in the United States for a few months, on two occasions (in 1942 and 1943) alongside Glenn Seaborg. He acquired invaluable experience in plutonium chemistry and its extraction, which became decisive in the early days of the French Atomic Energy Commission (CEA) after the war. Towards the end of the war, Goldschmidt and his team of British and Canadian scientists developed a new process to extract plutonium, which would become a precursor to the universally used solvent extraction process. Goldschmidt admitted near fifty years later that "it demonstrated for the first time the ineffectiveness of the secrecy policy established by the Quebec Agreements".[107]

When Halban's laboratory was set up in Canada, in addition to his scientific responsibilities, he was tasked with overseeing its administration, which he was unable to do, thus creating considerable tensions with the Canadian National Research Council. This was coupled with growing mistrust of the Montreal Laboratory on the part of the American authorities due to the number of nationalities working there, and particularly the French (none of whom had

[106] Letter from Jules Guéron to Frédéric Joliot dated 12 January 1943, p. 3; ABNF/MC, NAF 28161, Fonds Joliot-Curie, folder F-15.

[107] See Bertrand Goldschmidt: "La France et la non-prolifération*", Relations internationales, printemps 1992*, *op. cit.*

agreed to take on British citizenship at the beginning of the war, unlike many of their exiled colleagues). On top of this, President Roosevelt was distrustful of de Gaulle and Free France. Furthermore, for the American authorities, research led in Canada was more focused on the post-war period than on the short-term war effort. Consequently, they felt that it would be more difficult to justify this cooperation when they would be asked to explain their actions (particularly to Congress). The situation was at such a stalemate that no decisions had been made on the construction of a nuclear heavy water reactor. The only way to resolve the problem was the appointment of John Cockcroft in April 1944 as head of the Montreal Laboratory, who would be responsible for both scientific and administrative aspects. This change came about through dialogue between the American, British and Canadian governments. It was noteworthy, because the American authorities had accepted that the laboratory should evolve from the stage of research on slow neutrons to actually building a heavy water reactor.

For the British, the interest of the nuclear reactor was even more important now that they were convinced of the short-term future of the plutonium route. The situation in Canada also changed when Lew Kowarski (who had had a well-known falling-out with Hans Halban) decided to leave Oxford to work at the Montreal Laboratory. Several of his colleagues ended up following suit. By September 1944 the laboratory had around forty British engineers, the same number of Canadian researchers, the team of French researchers and a team of New Zealanders. Altogether, a dozen nationalities were represented.

Meanwhile, the United States planned to curb the amount of information flowing from American researchers to researchers based in Canada, especially in the fields of plutonium chemistry, fission products and methods for extracting and purifying plutonium. Of course, this decision did not sit well with the British or the French. James Chadwick would come up with a compromise that was accepted by the Americans. He proposed that the Montreal team work independently on the chemical properties of plutonium and on the extraction method. In July 1944, a site was chosen for the future nuclear reactor, near the village of Chalk River, 200km West of Ottawa. Lew Kowarski, who had begun working at the Montreal Laboratory around the same time, was asked to oversee the construction of the experimental reactor, called ZEEP – Zero Energy Experimental Pile. Although the reactor was not completed until September 1945, the research progress in Canada was such that "over the fifteen years following the war, no other reactor systems were proposed that had not already been considered in the discussions of the Montreal group during the war".[108] The ZEEP laid the foundations for France, the UK and Canada's post-war nuclear industries. The work that they accomplished was impressive considering the fact that the Americans had not let any Allied scientists, apart from James Chadwick, visit the Hanford atomic reactor.

In addition, long before the atomic bomb was developed, secret bilateral negotiations took place between the United States and UK regarding future cooperation in the nuclear energy

[108] Margaret Gowing: "Dossier secret des relations atomiques entre alliés, 1939-1945" (Britain and Atomic Energy; 1939-1945), *op. cit.*, p. 183.

field. Although the UK acknowledged the decisive contribution of the French nuclear scientists from June 1940, in early 1945, any direct participation by the Free French in the joint British-American effort was still being refused. However, at one point, British Chancellor of the Exchequer Sir John Anderson and Foreign Affairs Minister Anthony Eden considered a move towards greater openness under certain conditions (that it would not be immediate and would take into account security requirements), in the name of a "debt of honour" to France.[109] In their arguments to Prime Minister Churchill, the two men went so far as to inform him that there was a risk that the French would draw closer to the Russians if they were not more closely associated.[110] Winston Churchill's response was scathing, clearly underlining that he was opposed to sharing the secret with the French and citing strict compliance with the Quebec Agreements and his commitment to President Roosevelt. He also sought to explain that there was too much of a risk of the secret being passed on to General de Gaulle, using extremely harsh words against him.[111] This insinuated that Churchill was not informed of the initiative of the French nuclear physicists to inform de Gaulle in Ottawa in July 1944.

1.2.6. Dual loyalty of French nuclear physicists

In order to be able to work on British or American teams, scientists were obliged to refrain from disclosing the content of their work in a field that was clearly viewed as highly sensitive. This raised immediate questions surrounding the "double-loyalty"[112] of the physicists towards their new employers, the British government and Free France. This dual loyalty became a real issue at the end of the war, when the Free France nuclear physicists officially asked the British and Americans for permission to return to France and be released from their secrecy

[109] In the memo written to Churchill on 20 March 1945, the British Minister of Foreign Affairs highlighted the following point: *"*Whatever the value to be attributed to the work which the French did on TA [Tube Alloys] up to 1940 – and the Chancellor rates it pretty high – there remains the consideration that, in the summer of 1940, the French placed at our disposal two of their best scientific workers and their whole stock of heavy water. We made use of their men, their knowledge and their material and are surely, therefore, in honour bound to admit them to participation in at any rate that side of our TA work which can be represented as a continuation of their earlier endeavours.*"* A copy of the memo was consulted in the AHUE, Fonds Jules Guéron, folder JG-8.

[110] "The French have made it clear that, if we and the Americans do not in due course admit them to participations, they will have to turn to Russia"; letter from Eden to Churchill, *op. cit.*; however, nothing in the archives consulted gives any credit to this statement.

[111] In his memo to Anthony Eden dated 25 March 1945, Winston Churchill wrote: *"*At that time France was represented by Vichy and de Gaulle had no status to speak for her. I have never made the slightest agreement with France or with any Frenchman. I shall certainly continue to urge the President not to make or permit the slightest disclosure to France or Russia*"*, p. 2. The initial draft of the memo was even harsher, as Churchill seemed to accuse de Gaulle of double-crossing the British: *"*I was shocked at Yalta too when the President in a casual manner spoke of revealing the secret to Stalin on the grounds that de Gaulle, if he heard of it, would certainly double-cross us with Russia". He added, a little further in the discarded memo: *"*One thing I am sure that there is nothing that de Gaulle would like better than to have plenty of TA [Tube Alloys] to punish Britain, and nothing he would like less than to arm Communist Russia with the secret." A copy of the memo and initial draft were consulted in the AHUE, Fonds Jules Guéron, folder JG-8.

[112] The expression appears in an undated memo that seems to have been produced in the first quarter of 1945, titled: "Memorandum on security problems raised by employment of French scientists – Canadian NRY Project". The memo explained the problem as follows: *"*The double loyalties of these men [Halban, Kowarski, Guéron and Goldschmidt] present a problem in protective security which increases as the project progress towards fruition, and it is considered that the time has come to consider how and where they shall be employed in the immediate future. The problem is essentially one of safeguarding critical information about dates and production possibilities during a period which should not be longer than 12-18 months*"*; AHUE, Fonds Jules Guéron, folder JG-8.

agreement in order to resume their work in France, especially when the French Atomic Energy Commission (CEA) began its research in 1946. The Free France and Fighting France archives highlight the constant desire for France's role in the birth of atomic energy to be fully recognised, and especially the desire to remain a stakeholder in a field identified with national sovereignty, seen as a source for regenerating and rebuilding France's power in the post-war era. In a memo of December 1942 to René Pleven, National Commissioner for Foreign Affairs and the Colonies, the Department of Armaments[113] under Fighting France underlined that the "research in question, the subject of which was communicated to you verbally" (this could not be mentioned in this type of memo due to its highly secretive nature) was of "an important future interest for France".[114] In another memo, of February 1944, Pierre Auger, Jules Guéron and Bertrand Goldschmidt explained their position, saying, "The work we are involved in is of significant scientific and industrial interest for peacetime and for military purposes".[115] Post-war prospects were therefore a big part of their work for Fighting France.

However, while there was no doubt for Free France that the civil and military applications for the new source of energy were important (particularly in view of the pioneering role of the Joliot team in 1939/1940), a bureaucratic power struggle was secretly pitting the French and British against each other concerning the French scientists participating in the Allied effort in the field. This put the French nuclear physicists in a difficult position of dual allegiance to their homeland and to the British ally imposing the utmost secrecy on them.[116] In a memo to the director of Armaments (Colonel Morin), Jules Guéron explained the secrecy agreement forced upon them by the British: "You will see that I expressly reserve the rights of the FFC (*Forces Françaises Combattantes*) and that I am enduring with a somewhat heavy heart, various pettiness in the secrecy agreement and the questionnaire. Since the question as to this departure for Canada has been more clearly raised, I have asked the British authorities to take into account my obligations towards the FFC".[117]

One of the ways the British and Fighting France bureaucracies were able to exert their clout was the salaries paid to the scientists working for the Tube Alloys project. Holding the purse strings gave them the right to monitor the research and results, and allowed them to put

[113] This department, commanded by Colonel J.A. Morin, reported to the Fighting France *Commissariat national à la guerre* (National War Commissariat), directed by General Paul Legentilhomme.

[114] The purpose of the memo was to detail conditions under which Jules Guéron was dispatched to the Montreal Laboratory. Memo from the Fighting France Armaments Department to René Pleven, National Commissioner for Foreign Affairs and the Colonies, 10 December 1942; AHUE, Fonds Jules Guéron, folder JG-7.

[115] Memo sent to Wallace Akers (director of Tube Alloys) by Pierre Auger, Jules Guéron and Bertrand Goldschmidt concerning their administrative situation, 3 February 1944; AHUE, Fonds Jules Guéron, folder JG-7.

[116] Those who joined the Tube Alloy project promised to work exclusively for the British government and not divulge any secrets brought to their knowledge while working on the project. The document they had to sign was very clear. They undertook to turn over ownership of their research results to the Department of Scientific and Industrial Research (DSIR), as follows (taken from the template agreement that future members of the Tube Alloys project had to sign): "[…] In consideration of the Department entrusting me with the investigation or with any work in connection therewith I undertake not to make any application for any patent or other protection in respect of any such discoveries or inventions without the prior written consent of the Department […]"; AHUE, Fonds Jules Guéron, folder JG-31.

[117] Undated memo, most likely written in November or December 1942, from Jules Guéron to Colonel Morin, AHUE, Fonds Jules Guéron, folder JG-7.

pressure on the scientists. In this case, the *Bureau Scientifique de la France Combattante* (Fighting France Scientific Bureau), directed by Louis Rapkine[118] faced three scenarios:

- The *cases of Halban and Kowarski*: they were appointed in June 1940 by a minister under the Reynaud government to work with the British authorities. They were under contract and paid by the British, with their contracts governed by the French patent agreement signed with the British in 1942. Halban's contract ran until September 1947 (without the option of resigning), and Kowarski's until 30 June 1945 (with the option of resigning with one month's notice). However, the two French physicists had a distant relationship with Free France and were not recognised by General de Gaulle. Kowarski incidentally did not accept a passport issued by Free France until December 1942.
- The *cases of Auger and Goldschmidt*: they were hired and initially paid by the Scientific Bureau of the French Committee of National Liberation (in New York) in March 1942. In 1943, they were transferred to the Montreal Laboratory, working under and being paid by the Department of Scientific and Industrial Research (DSIR) until 30 June 1945 (with the option of resigning with one month's notice). This arrangement was approved by the Fighting France Scientific Bureau.
- The *case of Guéron*: Guéron joined General de Gaulle on 25 June 1940, and was obviously recognized by Fighting France, which seconded him to the DSIR's Cambridge Laboratory from December 1941 to December 1942. At the time, the DSIR was paying him but this generated a conflict between the two overseeing authorities.[119] In return for the secondment, Fighting France demanded that Guéron remain available for the Department of Armaments (for which he had been overseeing the Chemistry Laboratory until then). In a memo from the National Commissariat for War under Free France, General Paul Gentilhomme explained that Jules Guéron was seconded to the DSIR without pay but would spend one day per week working for the Department of Armaments, which "would reimburse his travel expenses".[120] Then, once the idea of transferring Guéron to Canada was raised (which took place in early 1943), Fighting France insisted that he be paid by the Department of Armaments, and therefore Fighting France, while still being seconded to the British government until June 1945 (with one month's notice required should he resign).

The situation therefore changed in 1942, at a time when plans were being made to transfer the Tube Alloys Laboratory from Cambridge to Canada, the idea being for it to be located close to the atomic energy specialists in the United States. The transfer took place in January 1943 and the DSIR team made the move to Montreal. For the British authorities, it was essential

[118] See the contribution from Diane Dosso in this book.

[119] Fighting France did not feel that his salary matched his qualifications and status as a former member of the "*Conseil supérieur de la recherché scientifique*" (CNRS), "which is the highest French official board for research"; see Memo from the Department of Armaments under Fighting France to Wallace Akers, director of Tube Alloys, 4 December 1941, AHUE, Fonds Jules Guéron, Folder JG-7.

[120] Memo dated 20 December 1941, signed by General Legentilhomme, National Commissioner for War. AHUE, Fonds Jules Guéron, Folder JG-31.

that the French nuclear physicists be involved, given their expertise and experience. For example, the British considered Jules Guéron to be one of the foremost scientists in the field and that his presence was crucial ("it would be a serious loss if we had to lose him at this stage"[121]). However, as Auger, Guéron and Goldschmidt later underlined, "our colleague who is paid directly by the CFLN has been kept out of British-American liaison missions in which he should have been involved".[122] Guéron had indeed been "sanctioned" for his direct ties with General de Gaulle's Free France. The three French nuclear physicists added that, as French civil servants, they did not feel able – "especially under the circumstances" – to personally enter long-term contracts with an official foreign organisation.

However, the dual loyalty was not just manifested towards the political authorities of the two countries. It also affected the relationships with the scientific authorities on each side. Those loyal to France, of course, mainly sided with Frédéric Joliot. Even though he stayed behind in France and was geographically far from his former colleagues, they made the effort to remain in contact with him. A letter to Joliot from Guéron and Kowarski sent in January 1942 from the Cambridge Laboratory attests to this. While telling him of their disappointment that he was not with them,[123] they warned him of attempts by occupying German forces to make him work for the Nazi regime. "This letter will be brought to you by the Fighting France forces. A small number of people are aware of our opinion that your presence as the leading scientist behind the discoveries of 1939 and 1940 was crucial. We do not know what your role will be in developing these discoveries, but on one thing we must be clear: do not accept any permanent engagements and do not sign anything by which you will be indefinitely bound without first consulting one of us, preferably Kowarski (…)".[124] Since the previous year, Joliot had joined the Resistance, refusing, like others, to give up his allegiance to "Eternal France".[125] In another letter, of January 1943, Guéron reiterated his high hopes for seeing the French Nobel Prize laureate join the team of French nuclear physicists, saying that he had heard that his colleague had "agreed in principle to come to England".[126] Jules Guéron had worked hard to try to sneak Joliot out of France, but once again, the scientist did not want to leave the country, as he was in fact highly involved in the Resistance. It should be noted that former Minister of Armaments Raoul Dautry also decided to stay in France, residing at Lourmarin in the Vaucluse throughout the Occupation. Despite requests from Free France, he refused to emigrate, and was still actively involved in the Resistance. General de Gaulle insisted on creating a special intelligence

[121] Memo from Wallace Akers, director of Tube Alloys, to the Department of Armaments under Fighting France, 20 October 1942, AHUE, Fonds Jules Guéron, Folder JG-31.

[122] Memo sent to Wallace Akers by Pierre Auger, Jules Guéron and Bertrand Goldschmidt concerning their administrative situation, 3 February 1944; *op. cit*.

[123] Especially since they were expecting that Joliot would make his way to the UK at some point or another, as seen in a letter from Jules Guéron to Frédéric Joliot dated 12 January 1943, which was not delivered in person until May 1945; ABNF/MC, NAF 28161, Fonds Joliot-Curie, folder F-15.

[124] Letter from Jules Guéron and Lew Kowarski to Frédéric Joliot, dated 12 January 1942, ABNF/MC, NAF 28161, Fonds Joliot-Curie, folder F-15.

[125] "*La France éternelle*" was the expression coined by General de Gaulle in his speech at Paris City Hall on 25 August 1944.

[126] Letter from Jules Guéron to Frédéric Joliot, dated 12 January 1943, ABNF/MC, NAF F-15, Fonds Joliot-Curie, folder F-15. This letter was not delivered to Joliot until May 1945, when it was delivered in person.

channel with him in order to obtain his advice on the changing political situation in France, and information of a more operational nature.[127]

In July 1944 while on a trip to Canada, General de Gaulle was secretly informed by the French scientists in Ottawa of the state of progress on the nuclear weapon. In his *Mémoires de guerre* (War Memoirs), General de Gaulle briefly touches on this meeting, stating, "I was secretly informed of the imminent results by Pierre Auger, Jules Guéron and Bertrand Goldschmidt, French scientists who, with my authorisation, had joined the Allied teams consecrated to this apocalyptic work".[128] It should be noted that de Gaulle does not mention Halban or Kowarski as they had not been directly ordered by him to go to the United Kingdom in 1940 (and although Halban was no longer in Canada in July 1944 after returning to the UK, Kowarski had already begun working in Canada). Jules Guéron, the only one of the three French nuclear physicists who knew General de Gaulle, was tasked with briefing him. The meeting was not easily arranged. First, they had to convince Free France's representative in Canada, Gabriel Bonneau, of the importance of the meeting, without giving him the specific reasons due to the sensitive subject at hand. Then, a few minutes had to be fitted into General de Gaulle's agenda so that the encounter could take place.

The secret meeting (there is no evidence that the Allies were aware of it) took place on 11 July 1944, when the leader of the Provisional Government of the French Republic (*Gouvernement provisoire de la République française* or GPRF) visited the residence of the Free France delegation in Ottawa. The French nuclear physicists did everything they could to escape being detected by the Allies. When de Gaulle asked to wash his hands, he was shown to a room where Jules Guéron was secretly awaiting. He had only three minutes to speak with the General, just long enough to relay a message prepared by the three French scientists. Bertrand Goldschmidt included the contents of the message in his own memoirs: "(…) a uranium-based weapon of extraordinary power should be ready within a year and first be used against Japan[129]. Possession of the weapon, developed in the United States, should give the Americans a considerable advantage in the post-war world. It is crucial that similar research resume as quickly as possible in France. This needed to be organised with Joliot and Francis Perrin. Finally, Madagascar needed to be kept out of the hands of the Americans due to its uranium resources (…)".[130] When General de Gaulle wrote about this encounter in his war memoirs, it was a huge scoop as it was the first time the information had ever been disclosed. Guéron,

[127] See Vladimir Halpérin, *Raoul Dautry*, *op. cit*., and confirmation provided by Robert Belot in this book, based on archives.

[128] Charles de Gaulle, *Mémoires de guerre*, vol. 2: *L'unité 1942-1944*, Plon 1956, reprinted by Presses Pocket, 1989, p. 286.

[129] Japan first appeared as a potential target for the first atomic bomb during the meeting between Roosevelt and Churchill at Hyde Park in September 1944, i.e. after this meeting with de Gaulle. It is therefore possible that, in light of the ensuing events, Goldschmidt may have given an abridged version in his memoirs.

[130] Bertrand Goldschmidt, "*Pionniers de l'atome*, "*op. cit.,* p. 266.

who had organised the meeting, was unhappy about the revelation as the former leader of Free France had not informed him ahead of time.[131]

1.2.7. Prospect of Free France nuclear physicists returning to France

The issue of the Free France nuclear physicists returning to France was not easily resolved, especially given the distrust of the American authorities (starting with the head of the Manhattan Project, General Groves) towards the French. Policy in this respect therefore varied dramatically. On the one hand, the United States sought to delay the return of the French specialists back to France for as long as possible, feeling that they had acquired too much knowledge that could be quickly put to use for national purposes. On the other, they felt that it was high time that the French physicists return to France so that they would stop obtaining first-hand sensitive information! The situation was especially paradoxical in that, in any case, the American authorities felt that the French could not be suddenly released from their secrecy agreement, especially since their presence was considered essential to the work of the British-Canadian group.[132] The French acquired substantial knowledge while working with the British and American teams. Even though a memo insinuated that Halban was the most well-informed of the French,[133] Goldschmidt was the only one to be in direct contact with the Manhattan Project, through his collaboration (albeit short) with Glenn Seaborg.

In 1944, the question as to the return or extended secondment of the French researchers became more pressing, with, once again, apparent differences between the cases of Halban and Kowarski and those of the "Free France nuclear physicists" in the strictest sense, i.e. Auger, Guéron and Goldschmidt. In this context, in the summer of 1944, John Cockcroft (the new director of the Montreal Laboratory) agreed with Louis Rapkine for Jules Guéron and Bertrand Goldschmidt, along with Kowarski, to remain working in Canada at least until the end of 1945. The case of Halban was less problematic since his contract ran until 1947. After leaving his position as director of the Montreal Laboratory, he continued to be paid by the British, with a contractual commitment until September 1946. In the same year, he began working at the University of Oxford at the invitation of Lord Cherwell (Churchill's scientific advisor) and Franz Simon (a professor at the university). As for Auger, he decided in 1944 to return to London to work full-time for the French scientific mission. Goldschmidt was the last French representative to definitively leave Canada, in late January 1946. The British

[131] This reaction provides an accurate illustration of the issue of dual loyalty faced by some French scientists during the Second World War, with loyalty towards the French Resistance, and towards their British ally, who enabled them to continue their research.

[132] These various case scenarios appear prominently in the archives concerning the Free France nuclear physicists, in particular in the archives for Jules Guéron and Frédéric Joliot.

[133] The aforementioned "Memorandum on security problems raised by employment of French scientists – Canadian NRY Project" (undated) detailed the breadth of knowledge of the French nuclear physicists as follows: "1*)* They have access to all reports and details of the work in Canada. This would include information on the experimental piles at Chicago and Tennessee, and information concerning certain difficulties encountered at the big piles at Hanford. 2) They know the location, approximate size and function of some of the principal units of the project. Halban's knowledge of this is more extensive than that of the others. 3) They have partial knowledge of the state of progress of various sections of the project and the existence of some of the principal problems impeding completion*"*; AHUE, Fonds Jules Guéron, Folder JG-8.

authorities kept him from returning for as long as possible as they felt that his contribution was crucial to the atomic reactor project in Canada. By staying in Canada, he was also able to gather as much information as possible, which would become extremely useful when work was resumed in France.

All in all, the British were highly favourable to continuing cooperation with the French scientists. In a memo sent out in the first quarter of 1944, the British authorities (DSIR) praised the loyalty of the French nuclear physicists and their role since May 1940 in contributing to British research.[134] Furthermore, as seen earlier, in July 1944, John Cockcroft had officially asked Louis Rapkine to extend the missions of Jules Guéron and Bertrand Goldschmidt for at least another year. Once again, the expertise of the French nuclear physicists was underscored.[135] Rapkine immediately gave his approval, saying that the work of the two French scientists at the Montreal Laboratory was beneficial to the laboratory and to France. He then wrote to Commander Bonneau, the representative of the Provisional Government of the French Republic (GPRF) in Canada, informing him of his decision, explaining that the other option would have been to keep Guéron and Goldschmidt, who had been chosen to be part of the French scientific mission in London (which Rapkine was to direct in the following weeks): "For me, we had to be absolutely sure of where Guéron and Goldschmidt would be of most use to France – Canada or the United Kingdom. A decision has been made. Guéron and Goldschmidt must remain in Canada, where their presence will be essential to the British, and their active contribution to the research project will be of inestimable benefit to French science and industry".[136] He then notified the two scientists of the official decision concerning their special transfer to the DSIR (while remaining members of the French scientific mission in the UK) for at least one year, with the possibility of returning to France for a short visit. Rapkine underlined the fact that the active involvement of the French nuclear physicists in Tube Alloys was considered "essential" by the British, and for the French, as "a crucial interest for our own country".[137] These words confirmed that resuming nuclear research on national soil was a priority for the French authorities. However, for the people concerned (Guéron and Goldschmidt), the decision made by the GPRF (French scientific mission) had not necessarily been a welcome one, especially since they had left their country (and therefore their families, friends and workplaces) four years earlier and France was on the road to being liberated.

The three "Free France nuclear physicists" (Auger, Guéron and Goldschmidt) were even more dissatisfied by the decisions made by the GPRF authorities to extend their mission with the

[134] The memorandum in question indicated: "A) The French members of the TA [Tube Alloys] organization, all of whom are in the Montreal Team, have given loyal service and are trustworthy men. Even if promises had not been given, they could not be treated as 'prisoners'. B) Information will get to Joliot and the French authorities eventually, whatever is done. C) The French, as leading pre-war pioneers and because, at the time of the collapse, they put their services and material at the disposal of the Allies, have a better claim than any other fourth country to participate in any post-war TA arrangements"; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-15.

[135] Cockcroft wrote: "Dr. Guéron and Dr. Goldschmidt are key members of the Division of Chemistry in the Laboratory and their services over this period are essential to the project"; Memorandum from John Cockcroft to Louis Rapkine, 24 July 1944, AHUE, Fonds Jules Guéron, folder JG-7.

[136] Letter from Louis Rapkine to Commander Bonneau, 28 July 1944, AHUE, Fonds Jules Guéron, folder JG-7.

[137] Copy of the memo from Louis Rapkine to Jules Guéron, 11 August 1944, AHUE, Fonds Jules Guéron, folder JG-7.

British without consulting them as they considered themselves (along with Halban and Kowarski) to be "the only French people capable of forming an opinion on the importance of the research, and the relative need for our ongoing involvement in the project".[138] For the French scientists, the priority was to rebuild the country and that they should therefore be fully engaged in this process. They felt it crucial to use their know-how and experience to help their country, under technical agreements between France and the United Kingdom concerning the contribution of France to present and future results. However, they explained that "the problem is that prolonging our exile will deprive us of the role we hoped to have in the immediate rebuilding of France".[139] Furthermore, in 1944 (probably in the summer), Jules Guéron, Bertrand Goldschmidt and Lew Kowarski (joining the cause of his Free France compatriots) wrote a draft memo explaining that they understood and of course fully supported the imperatives associated with the war, but that they had doubts concerning their usefulness outside France once it was liberated. In the draft memo, they also asked to what extent the extension was for security reasons and if the British were speaking for themselves.[140] In the same draft memo, the fate of which is unknown, but which paints a picture of the situation at the time, the French nuclear physicists asked that the extension not exceed one year, so that they could resume their university work on 1 October. Any further prolongation, they explained, "may seriously impair our [professional] future in France". They added that, if their return was not possible, they preferred being assigned to the United Kingdom rather than stay in Canada, so that they could be closer to France.[141] Finally, they called on Frédéric Joliot (as the new director of the CNRS) and Pierre Auger (as the new director of Higher Education) to arbitrate the issue. This position therefore departs from the official decision, which was not discussed between the French authorities, and in any case, was not challenged by the British and American allies.

Political and strategic considerations had taken precedence over all other factors. In their initiatives, the French scientists could count on the unfailing support of Louis Rapkine, who, as head of the scientific bureau of the French Committee of National Liberation (*Comité français de Libération nationale*, or CFLN), then the GPRF, acted as an interface with the French authorities. In this role, he interceded with the British, through his warm relationship with John Anderson, and with the Canadians, in order to inform them of the need for concessions to be made. He believed that it was essential for the nuclear physicists to take on a more direct

[138] Memo sent to Wallace Akers by Pierre Auger, Jules Guéron and Bertrand Goldschmidt concerning their administrative situation, 3 February 1944, *op. cit.*, p. 3.

[139] *Ibid*.

[140] The undated draft memo, of which the fate is unknown, was written in English so it could be read by the British authorities. It stated: "[…] such a decision can be justified once the country is liberated, only if we are of obvious, direct, definite and indispensable service to a common enterprise […] We do not know to what extent the prolongation we are being asked for (and the following one which are hinted at) are being prompted by security considerations. It is even possible that, in this respect, the British authorities do not speak only for themselves […]"; AHUE, Fonds Jules Guéron, folder JG-7.

[141] Pending the definitive return of the physicists to France, a compromise was later reached, not without difficulty (due to misgivings on the part of the Americans) so that they could first see their families and reconnect with their former workplaces in order to prepare their return. They were therefore granted leave to spend a few days in France.

role in the war effort on French soil, and be able to prepare for the post-war period.[142] The issue of secrecy and complete trust between allies was at the heart of the decision that had been "imposed" on the provisional government (even though no documents attest to this). However, the GPRF later asserted that detaining the French specialists under false pretences was no longer tenable, as they were needed in France. On 7 December 1944, in a change of stance with the newly formed provisional government, Louis Rapkine wrote to John Cockcroft to reiterate France's request to immediately release Jules Guéron and Lew Kowarski from their contracts, and in the case of Bertrand Goldschmidt, allow for additional time for his posting in Canada, but no more than six months, despite the fact that his presence in France would be highly useful. In the case of Goldschmidt, the British authorities had made it known that his services were absolutely necessary for several more months, given the expertise he had acquired in the field of plutonium extraction.

For Rapkine, further light nevertheless needed to be shed on the issue of secrecy, even though he felt that they could reconcile their future involvement in the French programme and upholding their commitment to the British to maintain secrecy.[143] In a letter sent to Frédéric Joliot, in January 1945, John Cockcroft underlined again the trust between the two parties, the restrictive rules regarding secrecy, and the role of international cooperation as a key factor in the future development of nuclear energy.[144] In the same month, Sir John Anderson wrote a letter to the British prime minister in which he paid extensive tribute to the French nuclear physicists and their role in the programme. However, in the same memo, he drew Winston Churchill's attention to the need to treat Hans Halban with some suspicion, as his behaviour, he said, could have put the Montreal team in jeopardy, and the risk of seeing France turn to Russia if they were not careful.[145]

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All told, the French nuclear physicists played a major role in the Resistance. Surprisingly, this role has been covered by French historiography in different ways, and could be considered to have made its way into the history books quite late.[146] It was this spirit of resistance that was

[142] In a memo to J. Jackson, dated 13 March 1944, Louis Rapkine underlined this: "In consequence, the French Committee feels that some of its expatriated scientists should fulfil such missions as are considered of immediate importance, both to its own present war effort, as well as to post-war problems which are far from negligible, in the case of a country which, like ours, has been overrun by the enemy"; AHUE, Fonds Jules Guéron, folder JG-7.

[143] "It is the point relative to releasing from their oath of secrecy those French scientists, when they go back to their country," wrote Louis Rapkine in the letter dated 7 December 1944; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-15.

[144] In this letter dated 7 January 1945, in speaking of Guéron and Kowarski, Cockcroft wrote: "I have told them that they are free to make use, for the purposes of your new Establishment, of whatever knowledge they have gained in Canada and England. I hope that it will be possible shortly to release from secrecy a great deal of the purely scientific work which has been done here and that this may be followed by a close degree of international co-operation. The most disagreeable feature of our work has been the lack of contact with our scientific friends in other countries"; ABNF/MC, NAF 28161, Fonds Joliot-Curie, box F-15.

[145] Memo from Sir John Anderson to Winston Churchill dated 2 January 1945, AHUE, Fonds Jules Guéron, folder JG-37.

[146] Paradoxically, although one of the first major books on the Second World War was written by Henri Michel, a member of the Resistance (published in 1968-1969), the saga of the French nuclear physicists went unmentioned. The same applies for historian Jean-Baptiste Duroselle in another major work on the period: *L'abîme 1939-1945* (1982). However, Robert Aron's book, *Grands dossiers de l'histoire contemporaine*, published in 1964, shed light on the Norwegian heavy water mission. Then, Bertrand Goldschmidt provided a first-hand account of all the nuclear-related acts of Resistance in two of his books: *Les*

at the very heart of the birth of the French Atomic Energy Commission in 1945, and its military division a decade later. The history of the CEA cannot be dissociated from the history of the Resistance. It is one of its trademark features, and remains a deep-rooted source of inspiration.

rivalités atomiques (1967) and *Pionniers de l'atome* (1987). Later, historian Alfred Grosser briefly mentioned their mission in *Affaires extérieures – La politique de la France 1944-1984* (1984). But it was Maurice Vaïsse in particular, who, as head of the French research group on nuclear weapons history, *Groupe d'études français d'histoire de l'armement nucléaire* (GREFHAN), the French branch of the Nuclear History Program (NHP), spearheaded research in the field. More recently, the *Dictionnaire historique de la Résistance* (published by Éditions Robert Laffont in 2006 under the direction of François Marcot) covers the subject in the article on Free France and scientific research; see article by Chantal Morelle, p. 753.

1.3. Nuclear physicists, the war and the emergence of a geopolitical awareness of technoscientific issues

ROBERT BELOT[*]

The Second World War played a decisive role in the transformation of French research, and in particular, in the way in which researchers perceive their role and the organisational methods, focuses and purposes of research.

The creation of the *Commissariat à l'énergie atomique* (French Atomic Energy Commission – CEA) is an excellent illustration of this "revolution". Its founders shared their experience of the war and the conviction that the era of technoscience had begun, with research aiming to transform rather than just understand the world. In a "memo concerning the atomic bomb and the use of nuclear energy" (*note concernant la bombe atomique et l'utilisation de l'énergie nucléaire)* dated 13 August 1945, which sought to "provide further explanations of the atomic bomb and the use of nuclear energy" and "highlight the role played by French researchers", Frédéric Joliot wrote: "I am convinced that, in spite of the feelings awakened by the application of atomic energy for destructive purposes, it will provide mankind with invaluable services in peace time".[147]

French nuclear physicists had succeeded in going beyond a purely academic approach to their emerging field of research to consider that research needed to meet the needs of a country with weakened resources and prowess. The attitude of the United States, which was looking to monopolise atomic science, nuclear supply and military use, led to an increased awareness of the importance of the geopolitical issues associated with atomic research. America was both a role model and a threat. The CEA represented the nation as its scientific founders walked a fine line between the pacifist and progressive ideal of a science without borders and the "culture of urgency and permanent engagement"[148] that took hold of the developed world from the 1930s. The commitment to fighting Nazism and the experience of war strongly influenced the start of the nuclear adventure in France.

1.3.1. Experience of war: the necessity of engagement and the spirit of defence

A. Pre-war period: creation of the CNRS

Let's begin with a little-known fact (because those seen as *responsible* for the war have been disgraced): scientists were required to prepare for the war before it started. The rise of Nazism considerably changed the way in which researchers perceived their role. The Popular Front in

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[147] Summary note by Frédéric Joliot-Curie concerning the atomic bomb and the use of nuclear energy, CNRS archives, 13 August 1945.

[148] Dominique Pestre, *Science, argent et politique. Un essai d'interprétation*, INRA éditions, 2003, p. 65.

France is an example of this, with the creation of a State Undersecretary Department for Scientific Research, and Jean Perrin is the symbol. Antifascist sentiment was responsible for the shift of the pacifist and internationalist left towards the acceptance of the need for national defence, as left-wing academics shook off the myth of "pure" and "disinterested" research to accept more applied research, focused on the need for national mobilisation against Nazi Germany: first, by agreeing to focus research on military applications; second, by bringing together research institutions and state systems (Jean Perrin, Henri Laugier, Pierre Biquard, etc), and finally, by participating in anti-fascist organisations (*Comité de vigilance des intellectuels antifascistes* – Watchfulness Committee of Antifascist Intellectuals, *Rassemblement Universel pour la Paix* – International Peace Campaign, *Cercles des Nations* – Circles of Nations, etc).

The history of the CNRS reflects this change. It started with the CNRSA (*Centre national de la recherche scientifique appliquée* – National Centre for Applied Scientific Research), predecessor to the CNRS, and a tool for modernising society while also ensuring economic and military defence against new dangers. Take the report presented to the French president on 10 September 1938:

> "In 1915, Paul Painlevé created the Inventions Department (*Service des Inventions)*. The Ministry of Public Instruction then became the Ministry of Public Instruction and Inventions of Importance for National Defence (*Ministère de l'Instruction publique et des Inventions intéressant la Défense Nationale*). This was the first time the public authorities had organised applied research. You may recall the excellent results obtained by this department during the war. It certainly contributed to the victory of our armies. In 1922, the Inventions Department became the National Office for Scientific and Industrial Research and Inventions (*Office national des recherches scientifiques et industrielles et des inventions*). The Act and Decree of 24 May 1938 created the CNRSA in response to new needs. This centre continues and builds on the work of Paul Painlevé by bringing it into line with the current state of science and the requirements of modern life, for both the National Economy and National Defence."[149]

The CNRSA took over from the *Caisse nationale de la recherche scientifique* (National Fund for Scientific Research) and the National Office for Scientific and Industrial Research and Inventions (ONRSII, created in 1922), also incorporating the Bellevue Laboratories Group (large electromagnet belonging to the French Academy of Sciences, and the low-temperature laboratory). The CNRSA was allocated a High Committee for the Coordination of Scientific Research (*Haut Comité de coordination des recherches scientifiques*), established in January 1939 following pressure from Joliot-Curie (who was one of the committee's vice-presidents[150])

[149] Musée Curie Archives (AMC), Fonds Joliot-Curie, F 14. Frédéric Joliot was highly involved in creating the CNRSA, hence the extent of documentation found in his archives.

[150] The other vice-president was Frédéric Surleau, an engineer and graduate of *Ponts et Chaussées*, after a background in railways. Joliot complained of the slowness of soldiers who did not seem to grasp the urgency and challenges. It was to this end that Raoul Dautry (an important supporter of Joliot in government circles) was appointed Head of the Ministry of Armaments in September 1939.

in order to better coordinate civil and military research and help relaunch "all of the country's productive forces" for the following reasons: "Research efforts since the war have, quite frankly, been insufficient. French technology is flailing far behind a number of nations". The linchpin of this creation was André Labarthe, a physicist close to Pierre Cot, who joined the leader of Free France from June 1940[151] and wrote the first book on Hiroshima.[152] He announced the creation of the CNRSA to Joliot as follows: "The decree has been signed. Thanks and warm wishes".[153] Both of Joliot's laboratories (Laboratory of nuclear chemistry and Laboratory of atomic synthesis) and Irène Curie's laboratory (*Institut du Radium*) were included in the structure of the CNRSA ("Group 1", dedicated to research of importance for national defence, led by Joliot). The CNRSA was led by Henri Longchambon, a physicist and professor at the Lyon Faculty of Sciences, assisted by Henri Laugier. The CNRSA was integrated into the *Centre National de la Recherche Scientifique* (National Centre for Scientific Research – CNRS), created by a decree of French President Albert Lebrun on 19 October 1939. War had been declared one month earlier. The CNRS was explicitly tasked with "facilitating research and work of importance for national defence and the national economy", in other words, organising the scientific war effort. During the opening ceremony on 24 January 1939, following a speech by Jean Zay, Jean Perrin spoke of the "scientific, economic and military greatness of our country".

"Group 1" launched biological research into "certain combat gases", ultrasensitive holometers to detect infrared radiation, calculating the initial speed of projectiles, static electricity phenomena produced when making powders, increasing the stock of heavy water and more. Joliot complained of complicated relations with the army. For example, Engineer and Army General Barillon, director of the Scientific and Technical Research Department at the Ministry of Armaments, wrote to Joliot on 26 April 1940 to inform him, under authority, that he was discontinuing a research programme: "You informed me of your interest in the issue of liquid oxygen explosives with a solid carbon fuel element. […] The decision has been made to delay the use of these explosives".[154]

The mobilisation of scientists was widely accepted. The *Union des intellectuels français pour la justice, la liberté et la paix* (Union of French intellectuals for justice, liberty and peace), established in late 1938, called for a collective push against fascism and the spirit of appeasement demonstrated by the Munich Agreement: "Intellectuals cannot remain impassive in the light of the particularly grave circumstances in which our country finds

[151] For more on the relationship between Labarthe and de Gaulle, see Robert Belot, *La Résistance sans de Gaulle*, Fayard, 2006, p. 52-53.

[152] Robert Belot, "Un militant de la mobilisation technoscientifique par temps de guerre : André Labarthe, de la création du CNRSA à la bombe atomique", *Les Savants, la Guerre et la Paix*, Simone Mazauric (ed.) [Actes des congrès des sociétés historiques et scientifiques collection], ISSN 1773-0899/, 2013.

[153] AMC, Fonds Frédéric Joliot-Curie, box F 14. Piece of paper handwritten and signed by Labarthe. The two men appeared to be very close, as proven by this letter sent in March 1939: "My dearest Fred, here is the report from the sub-committee of natural and artificial fuels. Warm wishes and all the best, Labarthe."

[154] Letter from Engineer and Army General Barillon, director of the Scientific and Technical Research Department at the Ministry of Armaments, to F. Joliot-Curie, 26 April 1940. AMC, Fonds Joliot-Curie, F 14.

itself...” The day after the German-Soviet pact was signed on 23 August 1939, the Union of Intellectuals published a manifesto in the press, declaring its “astonishment in the face of the turnaround bringing together leaders of the USSR and the Nazi Regime, at a time when they are threatening Poland and the independence of all free peoples”. It called for “all members of the French Republic to come together for the resolute defence of France and world freedom”. This manifesto was signed by Irène and Frédéric Joliot-Curie, Paul Langevin, Victor Basch, Aimé Cotton, Henri Laugier, Albert Bayet, Georges Fournier and Etienne Bougoin. At the time, the Union of Intellectuals was chaired by Irène Curie, who worked to denounce measures to expel academics from the USSR, Nazi Germany and Fascist Italy.[155]

Joliot was part of the first CNRS team. One of the patents filed in 1939 by the National Fund for Scientific Research related to “developments in explosive charges”. The fight against the Nazi evil justified this “engaged” conception of science and scientists. Science was at war. The scientific community was unified. Jean Perrin and Joliot co-chaired the High Committee for the Coordination of Scientific Research (*Haut Comité de Coordination de la Recherche Scientifique* – HCCRS), which was created in January 1939 and underpinned the mobilisation of scientists, with Henri Laugier as secretary general.[156] Joliot was more worried than others about the lack of natural ties between civil and military research, lamenting it in his letters. The need for “technoscience”, as it would come to be known, was largely recognised by the scientific community and public opinion.[157] It was the main focus of Raoul Dautry, the energetic Minister of Armaments appointed in September 1939, who launched an ambitious programme to link scientific research, industry and the state.[158] He became chair of the *Institut de Recherches scientifiques appliquées à la défense nationale* (Institute of Applied Scientific Research for National Defence), which would normally have fallen to the prime minister, and appointed Frédéric Joliot to the executive committee in appreciation of his commitment. The two men grew closer. In February 1940, Joliot sent Dautry a detailed report written by Kowarski, outlining the state of nuclear research, which led to the heavy water recovery operation.[159] It was not a chance of fate that led to this pair leading the birth of the nuclear industry following the Liberation of France.

[155] See Louis-Pascal Jacquemond, *Irène Joliot-Curie. Biographie*, Odile Jacob, 2014, p. 161-163.

[156] Jean-Louis Crémieux-Brilhac and Jean-François Picard (eds.), *Henri Laugier en son siècle,* CNRS Éditions, 1995, p. 86. Also see: Chantal Morelle and Pierre Jacob, *Henri Laugier. Un esprit sans frontières*, Brussels-Paris, Bruylant/LGDJ, 1997.

[157] Robert Belot, *L’Atome et la France. Aux origines de la technoscience française*, Paris, Odile Jacob, 2015.

[158] “Like Colbert, he was capable of action, and in the face of war, he had all the energy of Carnot”, to quote Jean-Louis Crémieux-Brilhac, *Les Français de l’an 40*, vol. 1, *La guerre, oui ou non ?* Gallimard, 1990, p. 105.

[159] See the film by Jean Dréville, *La bataille de l’eau lourde*, 1948, where Dautry and Joliot play themselves. See: Michel Pinault, *Frédéric Joliot-Curie*, Paris, Odile Jacob, 2000, p. 144-149. Also see: Per F. Dahl, *Heavy Water and the Wartime Race for Nuclear Energy*, Institute of Physics Publishing, 1999; Robert Belot, *Les Secrets de la Résistance*, Paris, Vuibert, 2013, p. 13-24.

B. The 1939–1940 war and mobilisation of scientists

The incredible story of the "battle for heavy water" demonstrates the extent to which the spirit of defence and engagement had taken hold of the intellectual community, and illustrates its capacity to meet political requirements and urgent situations.

Nuclear scientists fought the war in two ways – some as simple soldiers called up for duty and others as academics committed to their field. In 1939, Joliot was appointed Captain of Artillery on special assignment, and director of Group 1 of Scientific Research. "Using a false name so as not to draw too much attention," explained friend and colleague Pierre Biquard, "study into chain reactions continued".[160] His laboratory at the *Collège de France* was requisitioned. Joliot wrote to his mother on 22 September 1939, saying "We are working on lots of useful things in the laboratory and it is a great comfort at the moment".[161] On 14 January 1940, he explained: "… I am working as hard as I can for National Defence".[162] What does that mean? Did French nuclear physicists launch research at this time with the aim of creating a nuclear weapon?

We have testimony broadcast on Radio-Lyon on 11 August 1945, from a rarely quoted, yet particularly reliable and well-informed man, who outlines what Frédéric Joliot was really doing. This man is Raymond Valabrègue,[163] a member of the Resistance, and Commissioner of the Republic following the Liberation, who pursued a radical, socialist political career after the war. He started out as a chemical engineer, before studying law and becoming a barrister at the Court of Appeal of Paris in 1926. His two study fields led to his appointment as legal advisor at the *Institut national des métiers* (National Trade Institute), and then the *Conseil de la propriété industrielle* (Council of Industrial Property), where he defended the rights of inventors and the "patentability" of new plant products. This is also why he became a lawyer for the CNRS, and developed a friendship with Jean Perrin and Joliot. In 1939, he was responsible for drawing up the patents for the atomic decay processes invented by Joliot and his team. He states that this text "not only contains the invention of the atomic bomb, but also the potential for stopping the formidable energy produced by disintegration of the atom and then using it for creative rather than destructive purposes…"[164]

He believes that explosion experiments were planned:

> "For a mass of this size, the total energy released and resulting destruction would be such as to require an experiment in an immense uninhabited area, from which the explosion could be triggered at a distance of at least fifteen kilometres. On 1 September 1939, Joliot-Curie and his staff were about to combine the four tonnes to

[160] Pierre Biquard, *Frédéric Joliot-Curie et l'énergie atomique*, L'Harmattan, 2003, p. 67.

[161] Letter from Frédéric Joliot to his mother, 22 September 1939, cited in Michel Pinault, *Frédéric Joliot-Curie, op. cit.*, p. 589.

[162] *Ibid*., p. 139.

[163] French General Directorate for National Police. General Directorate for Intelligence, F7/15475-15539. Folder 4447.

[164] Cited in Géraud Jouve, *Voici l'âge atomique*, éditions Franc-Tireur, 1946, p. 83.

> check their hypotheses and calculations, in the heart of the Sahara Desert, in what they called the 'Pascal la Grande' experiment."

According to Valabrègue, "more than the catastrophic destruction of the atomic explosion, the inventors saw a huge increase in the creative power available to mankind". The lawyer recalls the passion of these young scientists, who were aware of the importance of their discovery:

> "I can still see them before me. Kowarski, a young, sporty and muscular Slav giant; Halban, small, slight and skinny with effeminate manners, a young German Jew expelled from his country by Nazi savagery and stupidity – what revenge! Francis Perrin, a bundle of nerves, obsessed by the compelling call of his intelligence; Joliot-Curie, directing with the affectionate authority of a young, yet great leader, who was responsible for the main invention and had followed its effects with his colleagues who had become his friends. For over ten exciting afternoons, I wrote, identified and removed all legal barriers as the infinite possibilities of their invention played before me in an earth-shattering film."

A second important testimony is that of Raoul Dautry, Minister of Armaments from 1939-1940, who was best placed to give a precise answer. On 11 August 1945, he declared:

> "Shortly after the start of the war, the Government had to ask Mr Joliot-Curie to direct his studies away from the use of radio-elements for energy generation, which is important to the industry in times of peace (despite the already extraordinary potential of this field), to focus more on the development of a process for the sudden release of atomic energy with effects infinitely exceeding those of existing explosives. It was at this time that I intervened as Minister of Armaments to provide Mr Joliot-Curie with all the resources he could need."[165]

A member of the team confirmed this in 1947: "The war only sped up efforts and you all know about the support of Mr Dautry, Minister of Armaments, and the operation which recovered the world's stock of heavy water from Norway, representing 185 litres. Research got off to an excellent start but was unfortunately brought to a premature end by military collapse".[166] Despite limited documentation and statements, it is undeniable that French researchers, who, according to Joliot, had understood the destructive and military potential of the discovery of fission before others, began working towards this hypothesis. With regard to the five patents filed, Henri Moureu (who organised the evacuation of the heavy water) explained: "In the first months of 1939, Joliot and his team had already understood the terrible threat to humanity of a potential armed conflict with Nazism".[167]

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[165] *Ibid.*

[166] Bertrand Goldschmidt, speech given on 1 August 1947 at the *Centre des hautes études administratives* (Centre of High Administrative Studies), Fonds Raoul Dautry, National Archives, 307 AP 224.

[167] Henri Moureu, "Connaissance de la matière. Frédéric Joliot et l'eau lourde", lecture of 7 December 1970, Collège de France Archives.

Frédéric Joliot-Curie understood the urgency of getting results that could be used by the military in the very short term. However, he lamented the limited performance and lack of responsiveness from the military sphere. "We all (Ministries of National Education and Armaments) suffer from a lack of coordination across all research projects of importance to National Defence".[168] On 15 February 1941, he wrote in the weekly employee newsletter *Les Nouveaux Temps* that this was primarily the fault of graduates of the *Ecole Polytechnique*, and that it is "the mindset that first needs reform" in the world of research.[169] Bearing in mind his contacts with the military in 1939 and 1940, he mocks *Polytechnique* graduates ("born well-to-do, therefore paralysed and already half sterile"), who he considered "the main reason for our industrial failings and deficient war productions". His verdict was brutal: "*Polytechnique* graduates have led our arms industry into disaster". This was, for him, the reason behind the dispersal of French research that needed to be solved.

His standpoint did not change after the Liberation. In late 1945, while working as director of the CNRS, he reported on CNRS involvement in the war during a lecture to the *Association française pour l'avancement des sciences* (French Association for the Advancement of Science).[170] Without going into detail, Joliot congratulated "the CNRS, which was created under these conditions, for all its services to the scientific war effort from 1939 to June 1940". However, he regretted that this effort had not been stronger, and might have even saved France if ties between research and the army had been more effective and underpinned by trust: "These services could have been much greater if the link between civil and military personnel had been built on solid foundations, but at the time, there were obstacles that could not be easily overcome, which meant that some results obtained in CNRS laboratories were not used". He assured the audience that the lesson had been learnt and that since the Liberation there had been "excellent relationships" between National Defence services and the CNRS. When Joliot was actively involved in the World Peace Council, *Le Figaro* (20 May 1952) reminded readers of his fighting past: "Has this scientist forgotten that on 4 May 1939 he filed a patent for the construction of atomic weapons?"

In short, we can say that French researchers were driven by a "spirit of defence" and that their engagement went beyond simple patriotism or citizen duty. This engagement was responsible for the raised awareness of a handful of researchers who understood that France needed to overhaul how its research was structured and how its purposes were defined.

C. Multiple forms of engagement in the French Resistance

The defeat of 1940 and German Occupation broke up the scientific community and led to a broad range of attitudes. Some scientists supported the Vichy Regime or openly backed a

[168] Frédéric Joliot to Marcel Laporte, 30 April 1940, AMC, Fonds Joliot-Curie, F 28.

[169] Jacques Saint-Germain, "As Mr Joliot-Curie says, it is the mindset that first needs reform", *Les Nouveaux Temps*, 15 February 1941.

[170] Frédéric Joliot-Curie, "La recherche scientifique en France", S*ciences. Revue de l'association française pour l'avancement des sciences,* no. 47, 1945, p. 2-14. AMC, Fonds Joliot-Curie, F 31.

policy of collaboration. Vichy supporters included Jean Thibaud, director of the Institute of Nuclear Physics of Lyon. Georges Claude could also be considered a collaborator. Both were excluded from the bodies involved in the resurgence of French research after the Liberation. Engagement in the Resistance came in various forms and strengths depending on the periods. Some scientists got involved in the Resistance early on, but outside of their research. This is the case of physicist Fernand Holweck, a faithful researcher at the Curie Laboratory who was arrested by occupying forces on 11 December 1941 and then assassinated. It is sometimes difficult to clearly identify the type and level of engagement, in particular due to the clandestine nature of the activity. This is true of the two founders of the CEA, Dautry and Joliot-Curie.

The prevailing idea concerning Dautry is that he did nothing, except refuse the demands of the Vichy Regime (which is in itself not nothing). Now, however, I am able to shed new light on this discussion. In British archives, I recently discovered a report on the French Resistance, which presents another view, in contrast to what is usually said of Dautry's attitude under the Occupation. Dautry was, in fact, involved in the Fighting France movement (as Free France became known) in London and part of the British secret services from 1942:

> *"Rex reported (262) that Dautry (263) was absolutely loyal to the Allied cause. Rex intended to propose to him that he should take over the control of the railways on D-Day. Dautry was prepared to set about studying the question immediately. London's approval was asked."*[171]

Another example: "*Salmon*[172] *reported on November 15th (264) that on instructions from Rex he had seen DOS [Dautry] (265) who was enthusiastic and agreed to take over control of French Transport after the departure of the Germans*". Salmon (Jacques Soulas) confirmed in a telegram that he had met with Dautry, who was opposed to the armistice and regretted not yet having been put in contact with de Gaulle. However, he refused an official position in Free France (*France Libre*).[173] Nevertheless, in British archives, we learn that, in the first quarter of 1943, General de Gaulle sent Jean Moulin letters addressed to five individuals, including Dautry.[174] Colonel Passy, head of the BCRA (*Bureau Central de Renseignements et d'Action* – Central Bureau of Intelligence and Operations), confirmed that Dautry entered the Resistance early on and "sent General de Gaulle letters testifying to his fighting spirit and ardent, vigilant patriotism".[175] For example, it is through Dautry that "Pallas" (André Manuel), Passy's deputy, sent to France in autumn 1942 to connect Resistance activities with Fighting France (*France Combattante*), succeeded in establishing contact with the Mayor of Lyon, Georges Villiers, and

[171] "Part II. Operations and communications with agents. October-December 1942", UK National Archives, Kew, HS7/246, p. 125.

[172] *Salmon*, code name for Jacques Soulas, who arrived in London from the USSR in autumn 1941. He was parachuted into France on 1 April 1942, on the orders of the Free France Commission of the Interior, with a large sum of money. His assignment in Lyon was to reach out to important individuals and convince them to move to London.

[173] "Part II. Operations and communications with agents. October-December 1942", *op. cit.*, p. 39.

[174] *Ibid.*, January-March 1942, p. 155. Other individuals: Daniel Mayer, Edouard Herriot, Louis Marin.

[175] Colonel Passy, *Mémoires du chef des services secrets de la France Libre*, Paris, Odile Jacob, 2000 (re-ed.), p. 468.

François Valentin, former head of the *Légion Française des Combattants* (French Legion of Combatants), whom he convinced to support de Gaulle. We can now better understand why General de Gaulle, once president of the Provisional Government of the French Republic, easily entrusted Dautry with the Ministry of Reconstruction and the creation of the CEA.[176]

Opinion is divided with regard to the attitude of Joliot-Curie.[177] He decided not to leave France, intending to adopt a policy of remaining there, like his colleague from the *Collège de France*, Lucien Febvre,[178] combined with a policy of nuclear abstinence. This is why he sent the stock of heavy water to London, with Kowarski and Halban. At the same time, he agreed to sign an article on his discoveries in a Vichy manifesto book titled *La France de l'esprit*, with a preface written by Charles Maurras,[179] and to be elected to the Academy of Sciences in late 1943, an appointment that was obviously approved by the Vichy government.

Bertrand Goldschmidt, a former scientist at the Curie Laboratory, who defected to *Free France*, regretted this act in his memoirs: "Joliot did not understand the considerable role he could have played. […] Joliot's prestige would have made a major contribution to French war efforts".[180] As he had to keep his laboratory running under the supervision of the Germans, he was suspected of "collaboration" by the Americans (which proves nothing), but also by the French, including André Mayer's son, a professor at the *Collège de France*, residing in Cambridge, USA, in 1941, where he was member of a Free France Committee; he reported that his father had told him to "be wary of Joliot-Curie" because he "worked with the Germans".[181] One thing is certain: Joliot was profoundly hostile to the Vichy Regime and opposed any idea of collaboration. For example, his compromise did not go as far as accepting an appointment to the Vichy National Council (*Conseil National*). However, Louis de Broglie, another Nobel Prize winner, this time in Physics, accepted an appointment to the Vichy council. Joliot demanded he step down from the CNRS board of directors.[182]

Joliot was suspected early on; on 29 June 1941, a police report attests that "he was taken to the *Direction des Renseignements Généraux* (Directorate of General Intelligence)" and "arrested on request of the occupation authorities" before being immediately released.[183] This

[176] Raymond Aubrac, *Où la mémoire s'attarde*, Odile Jacob, 1996, p. 168.

[177] See Nicolas Chevassus-au-Louis, *Savants sous l'Occupation. Enquête sur la vie scientifique française entre 1940 et 1944*, Seuil, 2004, p. 97-113.

[178] See: Peter Schöttler, "Marc Bloch et Lucien Febvre face à l'Allemagne nazie", in *Genèses*, no. 21, 1995. *Le nazisme et les savants*, under the supervision of Susanna Magri, p. 73-95.

[179] Frédéric Joliot, "Neutrons, électron positif et radioéléments artificiels", *La France de l'esprit. 1940-1943*, Paris, Sequana, p. 122-130.

[180] Bertrand Goldschmidt, *Le complexe atomique. Histoire politique de l'énergie nucléaire*, Fayard, 1980, p. 42.

[181] Memo by Captain Wybot on Joliot-Curie. Fighting France. Chief of the Military Staff of General de Gaulle, no. D 3982/BCRA, London, 24 September 1942. This intelligence is dated early 1941. *Service Historique de la Défense* (Historical Defence Service), GR 28 P9/12368. Interestingly, in a letter to Joseph Bancroft (from the Cambridge Laboratory of Physiology) dated 20 March 1941, Mayer assures him that he burnt documents concerning their research but regrets that documents from the national gunpowder factory in Le Bouchet, where Joliot carried out his experiments during the CNRSA period, fell into the hands of occupying forces. See: UK National Archives, Kew, FO 371/28483.

[182] Girolamo Ramunni, "Les élites du savoir et la technique", *De Gaulle et les élites*, Paris, La Découverte, 2008, p. 201-203.

[183] Paris Police Prefecture archives, 77 W 1735-74202.

was seven days after the German-Soviet Non-Aggression Pact was broken. On 29 January 1942, a police report mentions an investigation into Joliot from 3 December 1941, "following anonymous information that identified him as involved in preparing terrorist acts in an occupied territory". However, "the investigation yielded no results".[184] Another report from October 1942 stated that he was in no way involved in "anti-national propaganda".[185] There is not enough proof to say that Joliot was involved in active resistance, at least until March 1943, when he acquired a position in the National Front, where he met Jean Moulin and Pierre Villon, as has been corroborated by witnesses.[186] On 23 August 1943, Claude (Bouchinet) Serreulles, who temporarily replaced Jean Moulin following his arrest, proposed to extend representation of the National Council of the Resistance (CNR – *Conseil National de la Résistance*) to include Joliot-Curie and others.[187] He became an emblematic figure of the interior Resistance, thanks to the Communist Party.

Henri Moureu, the man responsible for exfiltrating the heavy water, summed up their joint decision to stay as follows: "But Fred and I have already made our decision. Some men must stay in France to resist the invader and Joliot's name has become a banner". Joliot worked in a very consensual manner, and contributed to the CNRS, without worrying about the behaviour of its director, Charles Jacob, whom he even defended after the Liberation. At the same time, he maintained secret contact with scientists hiding in the south, such as Namias. He held discussions with Minister Jean Bichelonne concerning the creation of SEDARS.[188] As Secretary of State for Communications, Bichelonne had such confidence in Joliot that, on 25 August 1943, he asked him "to immediately resume [his] studies into atomic disintegration, in particular research into the concentration of uranium 238 in natural uranium".[189] I also discovered that, in January 1943, he decided to create an engineering school, the *Ecole supérieure libre de chimie* (Free Higher School of Chemistry), with Robert Potier.[190] He was a communist at the end of the Occupation and became a leading figure in the National Front, a highly political resistance movement born after June 1941, which feared competition from the non-communist Resistance (MUR) and de Gaulle's Resistance.

Other French intellectuals were also double dealing and actively contributed to the Resistance, including those close to Joliot, such as Henri Moureu, former student at the *Ecole de Physique et de Chimie Industrielles de la Ville de Paris* (EPCI – City of Paris Industrial Physics and Chemistry Higher Education Institution), assistant director of the Joliot laboratory in the

[184] *Ibid.*

[185] *Ibid.* It is worth stating that the General Intelligence Services did not conduct their investigations in any great detail. In October 1942, they conducted a vast investigation into scientific spheres, but found no cause for concern. For example, they present Pierre Auger as a man "who has never attracted political attention". This is also true for Émile Borel (who had, however, already been arrested by the occupation authorities) and Robert Audibert.

[186] See Colonel Passy, *op. cit.,* p. 579-581.

[187] Diane de Bellescize, *Les Neufs sages de la Résistance. Le Comité général d'études dans la clandestinité*, Paris, Plon, 1979, p. 146.

[188] The *Syndicat d'études pour le développement des applications des radioéléments synthétiques* (SEDARS) (Study syndicate for the development of synthetic radioelement applications) was created in 1943.

[189] AMC, Fonds Joliot-Curie, F 148.

[190] Paris Police Prefecture Archives, 1 W 0735.

Collège de France, who became director of the *Laboratoire Central de la Préfecture de Police de Paris* (Paris Police Prefecture Central Laboratory) in July 1941. He was a member of the very small group that worked under the authority of Joliot to hide and transport the stock of heavy water from Norway. He sabotaged investigations and brought explosives captured by the police to Joliot, and also made "Molotov cocktails" during the battles of the Liberation, before investigating construction of the V1 and V2. It was he who encouraged the French government to take ballistic missiles seriously as military weapons. Joliot worked with electrochemist René Audubert, professor at the CNAM (*Conservatoire National des Arts et Métiers*), who paid public tribute to Jean Perrin's "winning audacity" and took part in the commando operation that freed Paul Langevin from his place of imprisonment in May 1944. His friend, Jean Wyart, first came into contact with the Resistance through physicist Jacques Solomon, Paul Langevin's son-in-law, with whom he created what would become the university National Front. This brought him into closer contact with Joliot, but he still published the monthly *Bulletin analytique du CNRS* (CNRS newsletter), which attacked Longchambon.[191] Chemist Léon Denivelle, the first secretary general of the CEA, also took part in the heavy water evacuation operation and played a decisive role in Paul Langevin's escape to Switzerland. According to the head of Fighting France intelligence (BCRA), General Paul Bloch-Dassault, who represented the Ministry of Defence in the CEA, was "organiser of the FTP units",[192] and was thereby in secret contact with Yves Farge, who orchestrated the Liberation of the Rhône Valley and Lyon. It was in the Rhône Resistance that Farge met Pierre Biquard, one of Joliot's classmates at *Ecole de physique et chimie industrielles de la ville de Paris* (ESPCI today) and his future chief of staff.[193] Farge, Joliot and Biquard came together again in the communist movement following the Liberation. Their friendship supported Joliot in his politics after the Liberation.

The other Resistance stronghold was located outside France. De Gaulle's Resistance was embodied by Free France. In the beginning, there were not many scientists. André Labarthe is an enigmatic figure who represented them for General de Gaulle, but, for unknown reasons, Labarthe had a noisy split from the head of Free France. It was not until Rapkine that a significant number of scientists rallied to the cause.[194]

French scientists who supported de Gaulle often lived outside of France and London. They met in Free France committees in the United States or South America. Members included: Pierre Auger (who joined the Free French Forces in 1941), Jules Guéron and Bertrand Goldschmidt, who were assigned by Free France to the Montreal Laboratory of Physics, following an agreement between the UK and Canada. Pierre Guillaumat, future director of the CEA, was a Free France soldier and important secret agent with the BCRA in Tunisia. He worked as a soldier rather than an engineer. Some scientists were also based in French Africa, such as

[191] Vincent Duclerc, "Recherche et Résistance. L'engagement des revues scientifiques françaises pendant la Seconde Guerre mondiale", *La Revue des revues*, no. 27, 1999, p. 77-98.

[192] Colonel Passy, *op. cit.,* p. 412.

[193] Yves Farge, *Rebelles, soldats et citoyens. Souvenir d'un commissaire de la République*, Paris, Grasset, 1946, p. 45, p. 161, p. 211, p. 244.

[194] See Diane Dosso's contribution to this book.

André Savorin, an officially trained mining engineer, who joined a Resistance network in the Ivory Coast from 1942. He was the one at the CEA to create the *Direction des Recherches et Exploitations Minières* (DREM – Department of Mining Operations and Research), with scientific guidance from mineralogist Jean Orcel, a pro-communist member of the Resistance from Paris, responsible for drawing up an inventory of uranium deposits in mainland France and overseas territories for the CEA.

Scientific resistance could also take the form of working directly with the Allies, outside of Free France, such as French nuclear physicists Lew Kowarski and Hans Halban, who were able to use their science for the war effort. In Canada, they met Pierre Auger, Jules Guéron and Bertrand Goldschmidt. On 11 July 1944 in Ottawa, Guéron revealed the existence of the Manhattan Project to General de Gaulle. Bernard Goldschmidt was involved in this programme and explained that they wanted to inform General de Gaulle of the existence of a "new weapon" in order to "take the necessary measures in France to quickly resume nuclear research" and launch exploration of uranium resources in Madagascar.[195]

In December 1940, Joliot's colleagues who had sought refuge in Cambridge, UK, were able to perform the experiment that he had conceived. For "the first time in the world", they demonstrated "the possibility of creating machines to generate energy using natural uranium". This enabled the British to considerably increase their scientific potential in the nuclear field, and draw ahead of the Americans. However, the Americans were the only ones with the industrial power to see this process through: "Without Halban, Kowarski and their heavy water, it is possible that the British would not have taken part in this research during the war, research which went on to open the door to plutonium production and the use of a new energy source".[196]

In 1947, Bertrand Goldschmidt is more explicit, daring to use the taboo word "bomb". In a speech at the *Centre des hautes études administratives* (Centre for high administrative studies), he said:

> "They [Alban and Kowarski] found themselves in a committee in England with all the major English physicists, including Chadwick, Cockcroft, and Oliphant, with the task of deciding whether or not it would be possible to create an atomic bomb during this war and whether its military effect would justify the effort required to make it."[197]

Just after the war, Joliot made no secret of his joy at observing in the official British report on the atomic bomb that "France's participation is loyally recognised", but regretted that the Americans were less forthcoming in their praise. This explains his insistence on mentioning the role played by French expats: "MM. Pierre Auger, Francis Perrin, Jules Guéron and

[195] Bertrand Goldschmidt, *Le complexe atomique, op. cit.*, p. 71-72.

[196] *Ibid.,* p. 76.

[197] Bertrand Goldschmidt, speech given on 1 August 1947 at the *Centre des hautes études administratives* (Centre for high administrative studies). British academics reached the following conclusion: "Chadwick soon concluded that the bomb could be made, but that the effort was not within the UK's reach, where industrial resources and academics were engaged in the immediate task of saving the island from invasion".

Bertrand Goldschmidt soon joined Halban and Kowarski, working in this British-Canadian team to support the major effort of creating the atomic bomb, an effort made yet more intense by the reasonable fear that the Germans would get there first".[198] There is no clearer recognition of the role that French scientists, who were key members of his team, played in creating the atomic bomb.

D. The scientific war: lessons from the battles for Liberation (1944-1945)

In 1944, after the Liberation of Paris, scientists from the interior French Resistance were able to re-establish contact with their expat colleagues. Now reunited, French science could finally play its role in the last act of this terrible war. General de Gaulle appointed Frédéric Joliot director of the CNRS on 20 August 1944, on the recommendation of communist Henri Wallon, secretary general of the Ministry of National Education, and entrusted him with this mission. As new director of the CNRS, Joliot was now all the more in favour of using science in the war effort because he had refused to leave France and his position at the *Collège de France* under the Occupation. He therefore had to handle a somewhat ambiguous situation, which led to various controversies.

Nevertheless, public opinion paints the picture of the man who invented fission involved in the war and victory. In their memorial book *Galerie mondiale des grandes figures de la Victoire,* Belgian publishers Leclecq and Haas were determined to honour the scientists who had contributed to the war effort. In 1946, they asked Joliot to send them a biography, stating "surely the entire world knows your contribution to victory through the success of your scientific research".[199] The allusion to the atomic bomb is clear.

In the period that immediately preceded Hiroshima, Joliot played an active role in the war. It is important to take the time to consider the unique period from September 1944 to September 1945, which is often ignored as it seems to have fallen victim to the later period where scientists, and particularly Frédéric Joliot-Curie, publicly spoke out in favour of the peace movement, under the guidance of the Soviet Union. We must avoid a teleological reading of events. We can see that there was an almost unanimous desire on the part of French researchers to point to what they had contributed to the Allied war effort and to return science to its role as a weapon against fascism and a source of freedom. This was the moment to reconnect with a culture of scientific war and for France to get back in the game. The defeat of 1940 prevented the CNRS from truly becoming an instrument of mobilisation and war, with results that remained "difficult to evaluate".[200] With the CNRS, French research rose from the ashes in an organised body, seeing through the work of the Resistance in the struggle for

[198] Press conference by F. Joliot, held on 25 July 1947 at the Intelligence Services, 27 rue du Mont-Thabor, Paris. Published following modifications in *Les Cahiers français d'information*, 16 January 1948, p. 7-11. Title: "La France et l'énergie atomique". AMC, Fonds Joliot-Curie, F 154.

[199] Letter from Leclecq & Haas, publishers in Brussels, to Frédéric Joliot, 19 March 1946. AMC, fonds Joliot-Curie, F 154.

[200] According to Denis Guthleben, *Histoire du CNRS de 1939 à nos jours*, Armand Colin, 2013, p. 37.

freedom. Joliot's purpose was twofold: to end the war and to lay the foundations for restructuring research in preparation for the future. In late 1945, he explained the following:

> "Here is the general approach we have followed for the first year, after meticulous discussions with many of our colleagues and particularly Georges Teissier, Assistant Director of the CNRS. It is very simple:
>
> - Effort to increase the number of researchers and technicians and to increase their professional value
> - Maximum participation in the war effort (because we were at war, let us not forget)
> - Preparation of research plans and new laboratory construction programmes, taking into account both the requirements of science and the country's economic situation
> - Since victory, creation of a scientific mission in Germany, responsible for studying the German problem, exploration and recovery of scientific equipment
> - Building close relationships between the CNRS and all research services dependent on the various ministerial departments […]
>
> In this way, we will bring our experience and working resources to the table, with flexible connections to coordinate a large proportion of the country's research." [201]

During the first CNRS board meeting held on 18 September 1944, Frédéric Joliot went beyond merely imagining the way in which this body needed to evolve to grow stronger and open up to industry. Relationships with the Ministry of War were the subject of most discussions. The country's scientific resources were used for immediate action, including mine detection problems, blood conservation, dried plasma, sound ranging, photoelectric "self-correcting devices" for "manufacturing various weapons of destruction (torpedoes, rafts, aerial bombs) capable of reaching their target despite aiming errors", and infrared radiation, etc.[202] A memo found in the CNRS archives demonstrates the need to actively ensure good links between research and the army: "It is vital to develop the war effort of French researchers and improve the support science provides to fighters".[203] Young researchers sought to get closer to war sites, explaining that "the real problems in the war can be seen on the ground. Researchers learning about these problems on site presents unrivalled advantages".[204] "Scientific observer

[201] Frédéric Joliot-Curie, "La recherche scientifique en France", *Sciences*. *Revue de l'association française pour l'avancement des sciences*, art. cit.

[202] Plans for a self-correcting device ("*Projet de dispositif auto-correcteur*"), 23 February 1945, National Archives, Fonds CNRS, box 190 0284.

[203] Plans for the participation of researchers in the war effort ("*Projet concernant la participation de chercheurs à l'effort de guerre*"), 2" February 1945, submitted, but not signed, by Mr Joliot, National Archives, Fonds CNRS, box 190 0284.

[204] *Ibid.*

delegates" were therefore sent to the front. Joliot approved and, speaking at the board meeting of 18 September 1944, stated that the CNRS needed a policy in this field:

> "This was part of my assignment one week ago in London as the war is still ongoing… We need to contribute to the continuation of the war and we need to rebuild, and in any case, it would be a serious problem if we did not contribute to the continuation of the war. From a military perspective, we are at war with Japan, which may last a while, and there is Indochina. We have to be present there." [205]

Arriving in London on 4 September 1944, Joliot attended meetings as part of the *Mission scientifique française* (French Scientific Mission) (led by Louis Rapkine, senior researcher at the CNRS,[206] under the authority of this body). He met with Francis Perrin and Pierre Auger. His expat colleagues explained to him that "very significant progress" had been made in the USA and Canada on the nuclear programme. They convinced him that "it was important to bring experiments back to France as soon as possible". They explained their unusual way of working and particularly the process for integrating research into military action.

With the official agreement of Joliot, in October 1944, they joined the *Groupe de recherches opérationnelles* (Operational Research Group) created by General Koenig, Senior Commander of the French Forces in the UK, which comprised 17 French researchers.[207] The French discovered that, in the three UK armed services, the results of operations were analysed by staff with a background in scientific research. For example, they visited the laboratories responsible for explosive mechanics. Reports were written and lectures given on various war topics, such as the "kinematics of manoeuvres" or "rationing and monitoring nutrition in the United Kingdom". Henri Moureu conducted research into "Germany's secret retaliation missile, known as V2". Charles-Philippe Leblond, who had worked in Joliot's Laboratory of Atomic Synthesis, studied the time and movement for loading and shooting the anti-aircraft canon, loading the "Crocodile" flamethrower or "factors affecting troop morale". Major mathematician Jacques Hadamard worked on "errors in aerial anti-submarine bombing". Pierre Auger studied "destructive mine clearance" and Michel Magat synthetic rubber. Joliot recognised that his colleague, Yves Rocard, for example, had "conducted interesting work in England on radiotechnology", particularly waveguides.

He admitted that it was a very different "conception of research" than what French researchers were used to. It required "real participation" by researchers in operational research. The British and American example was a model for Joliot when restructuring French research and justifying the pursuit of nuclear research.

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[205] This report was published by Michel Blay, *Quand la Recherche était une République. La recherche scientifique à la Libération*, Armand Colin, 2011, p. 75.

[206] Diane Dosso, *Louis Rapkine (1904-1948) et la mobilisation scientifique de la France Libre*, doctoral thesis, December 1998, p. 363-367.

[207] War Commission, Service memo dated 11 October 1944, National Archives, Fonds CNRS, index no. 19800284. The Operational Research Group reported to the General War Office, Army Scientific Bureau – "*Etat-major general Guerre, Bureau scientifique de l'Armée*". Rapkine and Auger were appointed scientific advisers, responsible for ensuring links with the CNRS and its director, Joliot-Curie.

A consensus was reached on the idea that, while science and technology contributed to the war effort, the war could also help science and technology reform their methods and move forward. This was the paradox that humanist scientists were confronted with. In a lecture to the *Association française pour l'avancement des sciences* (French Association for the Advancement of Science) in late 1945, the CNRS director outlined France's new scientific policy, based on a review of the involvement of the CNRS in the three phases of the Second World War. Joliot-Curie described the episode of the return to the war from 1944 as follows:

> "We participated in the war effort. Shortly after the Liberation of Paris, we created operational groups in collaboration with the French Mission in the UK. This gave us the benefit of English experience, and we provided scientific advisors, who played a key role in the work of military staff. Until then, in France we had never used scientific skills as much as we could have done for conducting operations. Things were different in the United Kingdom. One example is the study into the distribution of ship convoys for transport, which reduced torpedo losses by around 50%. This result and many others show how useful it is to maintain close and constant links between science and the Military Chief of Staff."[208]

It is in this capacity that the CNRS participated in the scientific mission in Germany to recover equipment.[209] The government created a *Comité de coordination scientifique de Défense nationale* (Committee for the Scientific Coordination of National Defence) in April 1945, whose vice-president "must be CNRS director". This committee established research programmes in "enemy" military and research departments, and provided "scientific, technical and industrial intelligence with a view to learning lessons on how to conduct war".[210]

As director of the CNRS, Joliot-Curie discussed the participation of researchers in the war in a military journal: *L'Armée française*.[211] His title, "*La guerre scientifique*" (Scientific War), was explicit. He reminded readers that French science was applied on national soil during military operations for the Liberation (1944-1945), with the detection and camouflage of mines, infra-red blocking devices to detect and neutralise an enemy patrol around 1,500 metres away, blood transfusion and dried plasma production processes, the analysis of aerial bombing carried out by the RAF on targets located in France, in order to "learn lessons from the RAF for pacing and distributing bombing in Germany". This article shows how the "re-founder" of French research considered the resurgence of science after the war, with this idea that the war changed the very essence of the scientific approach and its applications, preparing the way for the era of technoscience.

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[208] Frédéric Joliot-Curie, "La recherche scientifique en France", *Sciences. Revue de l'association française pour l'avancement des sciences,* art. cit.

[209] Corine Defrance, "La mission du CNRS en Allemagne (1945-1950). Entre exploitation et contrôle du potentiel scientifique allemande", *La Revue pour l'histoire du CNRS*, no. 5, CNRS Éditions, November 2001, p. 54-65.

[210] Memo on the *Comité de coordination scientifique de Défense nationale* (Committee for the Scientific Coordination of National Defence), 9 November 1945, National Archives, Fonds CNRS, index no. 180 0284.

[211] Frédéric Joliot-Curie, "La guerre scientifique", *L'Armée française*, no. 2, December 1945, AMC, Fonds Joliot-Curie, F 31.

Joliot-Curie intended to institutionalise this process by pushing for the creation of a *Comité de coordination de la recherche scientifique de la Défense nationale* (CCRSDN – Committee for the Coordination of Scientific Research for National Defence) in order to improve coordination of relationships between the CNRS and the military.[212] The committee was headed by General Paul Dassault, a friend of Joliot.

Above all, the founders of the CEA (*Commissariat à l'Energie Atomique*) were linked by their involvement in the Resistance, whether in France or as part of Free France, their rejection of the obscurantist and reactionary Vichy Regime, their common faith in the emancipating potential of the embodiment of instrumental reason, and a shared desire to promote technoscientific culture from an industrial perspective. This is what brought together the men and women of all backgrounds and origins who contributed to building the CEA institution.

Let's look at the *Comité de l'énergie atomique* (Atomic Energy Committee), official administrators of the CEA. The following appointments were made on 3 January 1946:

- High Commissioner: F. Joliot, member of the Resistance within the National Front
- Chairman: R. Dautry, although not an active member of the Resistance, he refused all offers from Vichy and was responsible for winning the "battle for heavy water"
- Three "qualified" individuals as commissioners: Irène Joliot-Curie (her illness did not allow active resistance, but her antifascist feelings had been known for a long time); Francis Perrin (exiled to the USA); Pierre Auger (joined the *Free French Forces* in 1941)
- Ministry of Defence representative: Ecole Polytechnique graduate, General Darius Paul Dassault, born Darius Paul Bloch (eldest brother of industrialist Marcel Dassault), before adopting his Resistance alias. He belonged to the Resistance "high society"[213]

Nine of the 10 members of the scientific committee in 1946 could claim engagement in the Resistance. Pierre Guillaumat, who replaced Dautry as chairman upon his death on 21 August 1951, was a member of the exterior Resistance under de Gaulle. He was more than just a member of Free France, as General de Gaulle appointed him to the elite Order of Liberation as a *Compagnon de la Libération* or "Companion of the Liberation". At the time, Guillaumat was director of Fuels in the Ministry of Industry and Energy. He was an officially trained mining engineer, representing the body of Polytechnique graduates of whom Joliot had such a low opinion. With him in place, the remaining communists at in the CEA would be kept under

[212] Philippe Varnoteaux, "La part du CNRS dans les débuts de la conquête de l'espace (1945-1965)", *La revue pour l'histoire du CNRS*, 2002, no. 6, http://histoire-cnrs.revues.org/3601. See also: François Jacq, *Pratiques scientifiques, formes d'organisation et représentations politiques de la science dans la France de l'après-guerre. La "politique de la science" comme énoncé collectif (1944-1962)*, Paris, École Nationale des Mines, 1996.

[213] On 20 August 1944, he was appointed by the representative of General de Gaulle in France as Military Governor of Paris. During the Occupation, he was secretly in contact with General de Gaulle. See: Claude Carlier, "Général Paul Dassault : l'armement et les études techniques de l'État-Major de l'Armée (1931-1945)", *Guerres mondiales et conflits contemporains*, vol. 243, no. 3, 2011, p. 93-102.

proper supervision.[214] Neither was Francis Perrin, a socialist, a member of the French Resistance. After taking up his post, he appointed Henri Piatier, a former member of the Resistance, who came from the Powders Department in the Ministry of Defence. At the same time, a network of post-war influence was being formed, with the first signs of Gaullist culture in state institutions. Guillaumat, Pierre Taranger, Albert Buchalet and Yves Rocard were agents for the Free France intelligence services, BCRA. In 1954, General Buchalet became director of the *Bureau d'études générales* (BEG – General Studies Office), where secret military nuclear research was conducted.

1.3.2. Lessons from the war: awareness of geopolitical issues

A. The fragility of France, the quest for greatness and independence

After the war, the French dreamt of "recovery" and "renaissance", two words that often appeared in the press. Recovery was as much political and moral as it was economic and technological. In 1945, political speeches talked of "greatness" and "power". This is well illustrated by the founder of the OCM movement (*Organisation Civile et Militaire* – Civil and Military Organisation) in a secret article written in May 1942, titled "*Au-delà de la Résistance*" (Beyond the Resistance): "This unity needs to last because the purpose of the Resistance, beyond the Liberation and re-establishment of France's territorial integrity, was a desire for greatness".[215] On 15 March 1944, the Resistance programme of action, adopted by the CNR, validated this ambition by stating that the mission of the Provisional Government of the French Republic, formed by General de Gaulle, was to "defend the nation's political and economic independence, and re-establish France's power, greatness and universal mission".[216] Promoting a new "science policy" went hand-in-hand with this shared ambition for national recovery.[217]

This is the message presented by Joliot to the *Commission générale d'organisation scientifique du travail* (General Committee for Scientific Management) in 1945: "The current situation of our country, which has been liberated but profoundly weakened, places a number of duties on all French citizens. Given the leading role that science must play in these tasks, scientists are aware of their responsibility, and are dedicating all their energy to the service of their country with great patriotism".[218] He explains that science is also the guarantor of a nation's liberty, saying that "all citizens must understand that it is only at the cost of intense scientific

[214] See what Yves Rocard says on this topic: *Mémoires sans concession,* Paris, Grasset, 1988, p. 161.

[215] Maxime Blocq-Mascart, *Chroniques de la Résistance*, Corrêa, 1945.

[216] René Hostache, *Le Conseil National de la Résistance. Les institutions de la clandestinité*, PUF, 1958, p. 461.

[217] Antoine Prost, "Les origines de la politique de la recherche en France, 1939-1958", *Cahiers pour l'histoire du CNRS*, 1989, p. 41-62. Dominique Pestre and François Jacq, "Une recomposition de la recherche académique et industrielle en France dans l'après-guerre, 1945-1970", *Sociologie du travail*, XXXVIII, 3/1996, p. 263-277; D. Pestre, *Physique et physiciens en France*, *1918-1940*, Paris, Éd. des archives contemporaines, 1984.

[218] F. Joliot-Curie, "*L'organisation de la recherche en France : le Centre national de la recherche scientifique*", Presentation given during the opening ceremony of the 17th Cégos study cycle, Cégos, 1945, AMC, Fonds Joliot-Curie, F. 69.

development that a nation can live happily and strongly; it is only by its strength of mind and the export of original creations that it can justify its free existence among other large creative nations".[219] This meant returning active science to a place of honour by promoting its social utility in achieving a common good. Although Hiroshima had stirred up anti-science feeling, Joliot developed a reassuring discourse to "defuse" the negative effects of the atomic bomb on public opinion, by presenting it as an indirect victory of French science.

De Gaulle's confidence in Joliot was based on his profoundly Gaullist discourse as representative of French research. "There is no doubt that science will play a considerable role in the reconstruction and independence of France", proclaimed the newly appointed CNRS director at the board meeting on 18 September 1944 on the national importance of science.

Science (and particularly nuclear science) as a means for recovery and a condition for independence were frequent themes in Joliot's public discourse. It is worth mentioning the speech he gave on 3 May 1947 before elected officials in the Saclay region,[220] when he explained how the CEA met the requirements for national independence and why it needed resources: "The country must make sacrifices to train researchers and technicians, as only they are capable of preventing France from becoming a colony". After the audience applauded, Joliot continued: "We want to remain independent, while maintaining a great friendship with other countries". This was a subtle position, as the technoscientific field had become competitive. "With each month that we delay, friendly countries such as the UK and the USA are filing patents, thereby creating future obligations for us. […] We need to move very fast, which is why we need to be near Paris." This is the reason why Saclay was chosen for the research centre.

France needed to be able to capitalise on its knowledge and skills: "French ideas have often been developed overseas. In each case, this is either due to financial reasons or local interests that opposed developing the invention in our country. Before the limitless possibilities that science could give our country, will you not take a step and say that you will contribute to the development of science in order to give France a leading position in this field? My team and I have a job to do and we have shown that we will not give up. We will do all we can for our country to succeed. We are taking responsibility, and we expect all parties to do the same. We will not leave for overseas. We will remain in our country and even if we cannot work under better conditions, we will not give up. All eyes are fixed on France at the moment. I travel a lot and it is sometimes hard to hear what others are saying about our country."

An internal CEA memo describes this "Gaullist" attitude of the new research centre. Priorities included France's position in the world, the urgency for material recovery in France and the reappropriation of a tradition of scientific and industrial excellence: "The conditions created by the war and then the Occupation and Resistance, resulting in the need to dedicate a large proportion of the national effort to meeting the urgent needs of reconstruction, are a real

[219] *Ibid.*

[220] Lecture for residents of the Saclay region, 3 May 1947 (in the presence of the Prefect), AMC, Fonds Joliot-Curie, F 33.

handicap for France in the global race for atomic research results and the development of the nuclear industry in its own territory. On the other hand, it is important to capitalise on the well-established tradition of nuclear research, especially in the field of radiochemistry, best practice in useful industrial processes like metallurgy for non-ferrous metals and electrochemistry, and finally, the fact that certain discoveries concerning uranium fission originated in France and that French scientists played an active role in Allied research throughout the war, as evidenced by official British and Canadian declarations".[221]

The initial CEA project was therefore resolutely and explicitly applications-oriented, with an industrial inspiration and a geopolitical focus on ensuring France's energy independence.[222] For Joliot, the CEA was the fruit of a long-term collective investment that needed to "pay off": "Since this time, laboratories have been built, scientists have worked there, and the financial participation of each French citizen in taxes has given France a prime position in this field, showing sceptics that science pays off". The fact that science is of social utility and in the national interest is at the heart of Joliot's intellectual ethos, which is why he insisted that "not only does it pay, it prevents us from being dependent on foreign nations and thereby ensures our independence".[223] It was in the country's greater interest in this new context that a real scientific policy be drawn up and implemented.[224]

B. Recovery through power

The desire for independence and requirements for reconstruction and global competition convinced intellectuals of the need for a "civilisation of power" (Bertrand de Jouvenel).

The politician who best defended and was responsible for France's new nuclear policy was convinced of this. This was Félix Gaillard, a figurehead of French radicalism and important member of the Resistance. In February 1944, he was second-in-command to Alexandre Parodi, representative of the Provisional Government of Occupied France, and played an active role in the Liberation of Paris. He recognised that "the moralists and intellectuals" were right to be outraged at the resources that science could offer the forces of destruction. But, he argued, to give this up would endanger "our civilisations". More than ever, power was the condition for freedom in an uncertain world: "Atomic energy is so great a demonstration of power that the huge regret of those who discovered it was not having buried their secret away in the depths of the earth. Perhaps they should show some remorse, but it is too late…" On 13

[221] "*Éléments d'information sur le CEA*" (sd), AMC, Fonds Joliot-Curie, F 71.

[222] Francis Perrin, "Vingt ans après", *Échos du CEA*, "1945-1965", October 1965, no. 2, p. 42. CEA Archives.

[223] Press conference given by F. Joliot on 25 July 1947 to the Information Office (*Service d'information*), 27 rue du Mont-Thabor, Paris.

[224] Robert Belot, "The political and cultural revolution of the CNRS: An attempt at the systematic organization of research in opposition to the 'academic spirit'", in Ana Simoes, Maria Paula Diogo, Kostas Gavroglu (dir.), *Academic Landscapes. Sciences in the Universities of Europe, nineteenth and twentieth Centuries*, Springer, 2015, p. 245-263; Jean-François Picard, *La république des savants*, Paris, Flammarion, 1990; François Jacq, "The Emergence of French Research Policy: Methodological and Historiographical Problems, (1945-1970)", *History and Technology*, 12, 1995, p. 285-308.

February 1960, after learning of the explosion of the French bomb in the Sahara, Félix Gaillard exclaimed: "At that moment, never had I felt more strongly that our country had truly overcome the defeat of 1940 and that there was a future for us". He had suffered seeing France brought to its knees under the Vichy Regime and understood the cost of fighting the inevitable as part of the Resistance. He believed that the atomic bomb had conjured away the humiliation of the defeat and the Occupation, and helped France return to power and therefore freedom.

The Manhattan Project represents the dawn of technoscience and of state ownership of research. It was also a model that inspired others. The atomic bomb was placed in perspective, and perhaps even absolved of its sins, in the name of this major shake-up of the relationship between science, technology and the state, which would surely lead to the reconstruction and progress of humanity. The prevailing feeling at the time was that Prometheus had quite justly defeated Faust! People believed that science had won the war against Nazism and Japan, against extreme nationalism and racism, against the denial of humanity and civilisation. Hitler had been a prophet of an age of barbarianism. The war had been won physically, but needed to pave the way for a spiritual victory. Science was seen as the light to take the world out of darkness, reconcile it with universal reason and re-enchant modernity.

A wave that I would describe as *technophanic* (*i.e. combining technical and symbolical interpretations*), invaded the science book market, focusing on atomic research and its powerful potential. Scientist Jean Thibaud published a book titled *Puissance de l'atome. De l'utilisation industrielle et du contrôle de l'énergie atomique au Gouvernement mondial* (Albin Michel, 1949), which can be translated as "The Power of the Atom. From the industrial use and control of atomic energy to world government". In 1947, Communist journalist and film historian, Georges Sadoul, published a remarkable and successful book titled *Mystère et puissance de l'atome* (Mystery and power of the atom),[225] which Joliot highly commended. Faced with the atomic revolution, Sadoul argued that we are the same as "primitive man who fled from fire, which was only considered to be a source of evil". It was only by stealing the first spark of fire from the gods that man was able to "distinguish himself definitively from animals". He encouraged mankind, who had now become "masters of atomic energy", not to fear or "belittle" "their own power". Sadoul was so little moved by events that his extremely comprehensive narrative of the Manhattan Project contains only a few, purely factual lines on Hiroshima.[226]

This stance was widely shared, something too little mentioned in historiography until now. Intellectuals shared the dominant belief that the power given to mankind through technoscience would serve a common good and that it was nuclear science that could control this power. This was a *doxa* that went beyond the small circle of nuclear physicists. For

[225] Georges Sadoul, *Mystère et puissance de l'atome*, éditions Hier et Aujourd'hui, 1947. This first appeared in a regular section of *L'Humanité* in March 1946.

[226] "Seven weeks later [after the experimental explosion of 16 July 1945 in New Mexico], a second bomb exploded, no longer for experimental purposes. It destroyed the Japanese city of Hiroshima. All the experiments conducted in the United States between 1941 and 1945 had just one aim – the war." A less emotionally engaged account is impossible to imagine.

example, let me quote biologist Marcel Prenant, professor at the Sorbonne and member of the Central Committee of the Communist Party, who considered nuclear science to be just another source of progress: "The atomic bomb has given this (progress) novelty. However, we know that atomic energy, used for other purposes, could be a prodigious source of well-being. Qualified physicists such as Paul Langevin and Joliot-Curie believe that it will soon give each man the mechanical equivalent of forty slaves, giving us all a life of leisure and luxury that will place us in the ranks of the most fortunate and wealthy. […] Since the invention of gunpowder, explosives have caused much harm, but have also been used to build roads, tunnels, railways, ports and mines".[227]

At this time, the Soviets remained hostile to the use of the atomic bomb as a "weapon of aggression and mass destruction of people", but considered atomic energy of interest for "improving the life of people around the world, increasing their well-being and developing human culture".[228] In the immediate aftermath of the war, before the start of the Cold War, French scientists were unashamed to mention France's "greatness" and "rank". On the contrary, science had actually been strengthened, and found new legitimacy in its use for military purposes. During the CNRS board meeting held on 18 September 1944, Joliot highlighted the role that science could play both for the "reconstruction of France" and ending the war: "There is no doubt that science is currently winning the war, but this science that is currently winning the war needs to keep going".[229] Conducting scientific research was considered a "strength": "In short, I wish to create real scientific research, the strength of scientific research". He defended his opinion publicly. In his article "*La guerre scientifique*" (Scientific War) published in the journal *l'Armée française,* he stated that "in truth, the only war today is scientific",[230] explaining that France's recovery would need "a policy of power". Knowledge and power went hand-in-hand in 1945.

How did this scientist reach this futureproof conclusion? His thesis was simple yet radical. In an age of "total wars", "the only war is scientific", and this war affected all sectors of human activity, including industries, the economy, food and public health – in short, "all areas of life of the nations engaged in battle". Joliot explained that the other major consequence of "total war" was a blurring of the lines between peacetime and wartime, and the dawn of economic war as a means of pursuing war by other means: "Periods of peace are filled with struggles to access the regions that produce the raw materials required by modern industry and the jobs required to launch production, which is the only solution to unemployment problems. The

[227] André Siefried *et al*, *Progrès technique et progress moral*, La Baconnière, "Rencontres internationals de Genève", 1948.

[228] Quoted by Jean-Christophe Romer, "L'URSS après 1945 : l'obsession atomique", in *Renseignement et propagande pendant la Guerre froide (1947-1953)*, éditions Complexe, 1999, p. 62-63.

[229] Minutes from the CNRS Board Meetings of 18 September 1944, in *Histoire documentaire du CNRS, tome 1. Années 1930-1950*, *Comité pour l'histoire du CNRS*, CNRS éditions, 2005, p. 324. Also see: Pierre Biquard, *Frédéric Joliot-Curie…, op. cit.,* p. 87-92.

[230] Frédéric Joliot-Curie, "La guerre scientifique", art. cit. He lamented the fact that, in France, "all scientific research with a view to national defence was prevented from 1940 to 1944, at least openly and on a large scale, by the enemy occupation. However, we had excellent information and an adequate structure in the National Centre for Scientific Research (*Centre national de la recherche scientifique*)".

wars that these struggles lead to in the short or long term are increasingly conducted from an economic perspective with operations to target communication lines, blockades and, more recently, the systematic destruction of the enemy's industrial potential across their entire territory". In this new war, science was the "determining factor". The "policy of power" was therefore seen to be determined by technical and scientific innovation, and access to resources.

The balance of power between nations was therefore dependent on this reasoning, which put science and technology back at the heart of the processes of innovation and the recovery of power: "The development of a certain technology makes a particular raw material a vital ingredient in the policy of power; the invention of a certain process removes a monopoly, which could be a means of exerting pressure on neighbours for strong countries or present a threat to their independence for weak countries, and so the picture changes with each discovery. Competition in peacetime and wartime operations have become dangerously similar, and both are at the mercy of the whims of scientific discovery". [231]

In this article, drawing on lessons from the Second World War, Joliot explains that military action had become more scientific and science had become more military in nature. French science had shaken off its theoretical failings to finally reconnect with practical reality, opening the door to technoscience. This is why the CNRS director intended to do everything in his power to ensure that this momentum did not fall back into a rut after the war: "This work has not stopped with the war, but has changed nature. We now need to capitalise on our victory and contribute to the restructuring of national defence". Remember that, in April 1945, the government created a Committee for the Scientific Coordination of National Defence, which reported to the Chief of Staff of National Defence and whose vice-president had to be CNRS director. "This shows the extent to which the close ties between National Defence and Scientific Research were deliberate and organised." What lessons could be learned from this war and the use of science? Joliot gave the following answer: "The lesson from the recent war is clear: it is during peace time that scientific research must be applied to national defence, and results can only be achieved through the systematic and comprehensive organisation of cooperation between scientists and the military. […] One could say that science has made the greatest contribution to victory over the powers of evil. We believe that, in the future, science will be the leading factor in keeping the peace".[232]

Joliot-Curie alerted politicians to the urgency of giving science the position it deserved in society, explaining that the Ministry of Finance must be convinced that "a large country's best investment is to pour a significant proportion of its resources into science and technology. Other countries have understood this and we all know the great benefit to America of this research policy, which is supported by the public authorities and private companies. France

[231] *Ibid.*

[232] *Ibid.*

must follow this example, in line with its own resources and genius".[233] Politicians therefore needed to trust scientists as they had understood the importance of geopolitical challenges.

C. Facing Hiroshima and absolving nuclear science

When researching my book *L'Atome et la France*, I was struck that Albert Camus' moral alert in the aftermath of Hiroshima and Nagasaki was extremely isolated. There was a certain indifference to this tragedy, which was considered to be just one among many in a war of mass destruction that had taught mankind to expect the worst. At the same time, there was a belief in the active and beneficial power of science and technology, which had finally been reconciled. *Le Monde* newspaper announced on 20 December 1945 that "the world should trust physicists – the atomic era has only just begun".

The general tone of reactions is similar to what Raoul Dautry said in a radio address on 8 August 1945: "We now need to resume the effort we were forced to relinquish and work to master atomic energy for peaceful purposes and no longer in the pursuit of death. I am convinced that French science will take its place in this worthy human task".[234] Joliot-Curie had a similar view and played a major role in this process of absolving nuclear science in the name of the greater interest of humanity. While still only CNRS director, the day after Hiroshima, he praised the "benefits" of mastering atomic energy for humanity and France. For example, writing in *L'Humanité* on 10 August 1945, he proudly defended long-standing French nuclear research ("French scientists were the first to discover the main principles behind the construction of the atomic bomb") and declared his belief that the civil use of this new source of energy in the future "will provide mankind with invaluable services in peace time". One day later, the Nobel Award winner was able to express his opinion at length in *Paris-Presse*, which had sent its "special correspondent", Raymond Henry, to interview him: "Yes, Professor Joliot-Curie told me, with his trademark boyish laugh, we are somewhat surprised to see that President Truman's declaration to inform the world of the existence of this bomb did not make reference to France's contribution and the origin of this discovery. Of course, most countries conducted research into atomic decay. But apart from this research, people need to know that the atomic bomb would not exist without two experiments by chemists: the first dates back to 1938 and was performed by my wife, Irène Curie. This experiment led to the second in early 1939, which took the German professor Hahn's work in a new direction".[235]

Dautry and Joliot were not alone. Theologian and scholar Teilhard de Chardin also refused to consider the issue in moral terms. In the journal *Études*, he attacked those who renewed discussion of "Promethean Man" in the aftermath of Hiroshima, and praised the scientists responsible for the technical and scientific prowess of the Manhattan Project: "As if the duty of any man were not to definitively push the boundaries of all the creative powers of

[233] *Ibid.*

[234] Quoted by Michel Avril, *Raoul Dautry (1880-1951). La passion de servir*, France-Empire, 1993, p. 266.

[235] *Paris-Presse*, 11 August 1945.

knowledge and action! […] How, in the face of this success, would he not feel exalted, like never before in his life?".[236] On 12 August 1945, in an article in *L'Humanité* titled "*À propos de la bombe atomique*" (On the atomic bomb)*,* Joliot declared: "Although the USA's staggering research and manufacturing effort is admirable, it in no way lessens the fact that the first principles behind this creation were discovered in France and constituted a vital contribution to mankind's latest conquest over nature".[237]

In an article sent to the *Revue de l'Armée*, dated December 1945, Joliot revisited this issue of the French contribution to the discovery, reminding readers of the pioneering role of French research in the discovery of "uranium fission". Joliot delighted in reminding readers that the Americans had been behind in this field. For the first time, he directly acknowledged that "we immediately presented the possibilities of the phenomenon with regard to explosives, and consequently war applications", adding, somewhat slyly, that this was not something that the Americans had initially foreseen. He specified that the results obtained were sufficiently concrete to result in secret patents, but regretted that the process had come to a stop after France's defeat in 1940. Irène Curie agreed and, in a report into "Radioactivity in France" (1949), boasted that "Einstein mentioned Frédéric Joliot's work in his famous letter sent to President Roosevelt to encourage him to inject massive resources into research to create the atomic bomb". [238]

Despite Hiroshima, Joliot chose to believe in the "beneficial purposes" of nuclear science. However, what is less widely known is that he did not exclude a military use of nuclear science, at least in summer 1945, a few days after Hiroshima. The CNRS archives contain a significant, and perhaps never-before-seen, document, a "Summary report from Frédéric Joliot-Curie concerning the atomic bomb and the use of nuclear energy" (CNRS, 13 August 1945): "A monopoly of such energy sources and their military application by one or two large nations could be feared. This fear would be justified for uncivilised nations; but it would be madness, because regardless of the instantaneous power these nations would have, frantic researchers would soon find another more terrible and perhaps more insidious weapon in another part of the world".

"Civilised" nations therefore needed to take an interest in nuclear science. In this same report, the CNRS director refutes the idea that the French government (1939-1940) "refused to allow Joliot-Curie to carry out large-scale experiments in the Sahara". He explained that "the

[236] Teilhard de Chardin, "Quelques réflexions sur le retentissement spirituel de la bombe atomique", *Études*, October 1946, p. 223-225.

[237] Frédéric Joliot-Curie, "À propos de la bombe atomique", *L'Humanité,* 12 August 1945.

[238] In his letter to President Roosevelt on 2 August 1939, Albert Einstein mentioned Joliot's work: "In the course of the last four months it has been made probable – through the work of Joliot in France as well as Fermi and Szilard in America – that it may be possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future. This new phenomenon would also lead to the construction of bombs; and it is conceivable – though much less certain – that extremely powerful bombs of a new type may thus be constructed." Regarding the contribution of Joliot's team, see: Spencer R. Weart, *Scientists in Power*, Cambridge (Massachusetts), Harvard University Press, 1979.

materials he had at the time, thanks to the effective support of the Ministry of Armaments, were nevertheless insufficient to build a bomb".

D. In the shadow of American hegemony

This opinion lasted a long time. Joliot quickly understood, independently of his pro-Soviet feelings, that the United States was seeking a monopoly of atomic science and supply.[239] He was already frustrated by the silence of the American authorities on the subject of France's contribution to nuclear research and the process leading to the atomic bomb when he discovered the importance of the geopolitical issues associated with atomic research and the consequences of the American victory for French nuclear policy.

From November 1945, Joliot and *L'Humanité* worked against the United States' desire to hold onto the secrets of the atomic bomb, and in favour of the free exchange of scientific knowledge. The fact that the US alone held the secrets to the atomic bomb, and conducted nuclear tests in Bikini, made it more of a threat than a role model. France's cultural, political and economic independence was "threatened". The Communist Party wanted to "save" France by establishing "groups of national forces to defend the threatened independence".[240] This circumstantial neo-nationalism supported the desire for energy independence. Nuclear science was strengthened by France entering the Cold War, as it was perceived and sold as an instrument of independence.

This was a favourite topic of physicist and author André Labarthe, a friend of Joliot.[241] In his little-known book *Le Statu Quo de la peur*, this Giraudist veteran of Free France explained that the Americans' policy on secrecy sought to build a "scientific wall" and "confine research within a fortress" so that the deadly bomb did not fall "into the hands of the Cossacks". The Americans intended to do their utmost to maintain this monopoly for 10 years in the face of the Soviets as it made them "the most powerful nation in the world", as Truman said the day after Nagasaki.[242] Labarthe denounced American hegemony as "scientific egotism": "Using atomic power to police the world, even for the best possible reasons, is a very difficult and disappointing task".

The strongest critic of the American government was Yves Farge, Minister of Supplies in 1946, and former Commissioner of the Rhône Republic in 1945, secretly responsible for the Action Committee against Deportation which organised the *Maquis du Vercors*. He joined the *Mouvement de la Paix* in 1947, which he chaired until his death in 1953. Yves Farge was one of just three French men who attended the atomic demonstration at Bikini Atoll in July 1946. He was a friend of Joliot and Pierre Biquard, Joliot's faithful colleague who had been his deputy

[239] This is why Joliot set up an exploration school by creating the *Direction des Recherches et Exploitations Minières* (DREM – Department for Mining Operation and Research). Those conducting explorations had often been members of the Resistance.

[240] Georges Soria, *La France va-t-elle devenir une colonie américaine ?*, éd. du Pavillon, 1948, p. 201.

[241] André Labarthe, *Statu quo de la peur*, Défense de la France, 1946. It was printed on 1 October 1946, so the author was able to share his trip to Bikini, where he witnessed two American tests.

[242] Quoted by André Fontaine, *Histoire de la Guerre froide*, Fayard, 1974, vol. 1, p. 313.

chief of staff in 1946. Yves Farge believed that America was preparing for war and global hegemony, which explained why it had retrieved Nazi scientists from Peenemünde and organised "the transfer of this laboratory of global destruction in which Chancellor Hitler had placed all his hopes". He considered this to be "the most appalling event of the post-war period", inspiring the title of his book published in 1948: *La guerre d'Hitler continue* (Hitler's War Continues). This book broke with previous perceptions of nuclear science and the United States, laying the groundwork for a more condemnatory reading of Hiroshima, with a sole focus on the horror: "These two bombs opened the door to a tragedy that could exceed the horror of what we have just experienced".[243] According to Yves Farge, "behind the mask of Hiroshima, hides the haunting image of the mass grave at Auschwitz".[244] He believed that America was "following in the footsteps of Hitler and Goebbels". *L'Humanité* newspaper then picked up this association of America and Nazi Germany. Pierre Courtade went as far as to speak of the "concentration camp of Marshall Europe".[245] American hegemony was also evident in the energy sector. Farge talked of "a race for treasure" to describe the global battle for raw materials, in direct opposition to the United Nations principles, before the ink had even had time to dry. In addition to nuclear science, the United States had launched a new colonial policy to consolidate its influence and power in countries with large reserves of oil, coal and "political metals" such as tin, tungsten and mercury.

Joliot publicly raised the alarm in 1947: "Vague, yes vague, intelligence suggests that attempts are underway to take uranium from across the globe and transport it to America. Several thousand tonnes of uranium have, in fact, been sent to the USA".[246] Joliot knew better than anyone that the atomic industry needed raw materials. He explained that "in the international competition for the industrial use of atomic energy, the countries that hold these unparalleled riches will lay down the law for those who have failed to master it".[247]

Joliot mentions the importance of energy independence in his preface to Georges Soria's communist book, *La France deviendra-t-elle une colonie américaine?* (Is France set to become an American colony?) (1948). His first sentence is clear: "We are witnessing a very powerful surge in American economic imperialism".[248] Joliot opposed a nuclear policy that sought to "monopolise the results of science for destructive purposes and use them more or less directly and openly as a means for hegemony". Soria warns against an attempt at total, economic, energy, military and cultural domination. The Marshall Plan is compared to "*a war plan*" that France needed to resist by refusing to give up its civil nuclear programme and doing its utmost

[243] Yves Farge, *La guerre d'Hitler continue*, La Bibliothèque française, 1948, p. 50. Farge wrote this between October 1947 and January 1948.

[244] *Ibid.,* p. 16.

[245] Pierre Courtage, "La France colonie américaine", *L'Humanité*, 22 June 1948.

[246] In his lecture on 25 July 1947 at the Information Services (*Services d'Information)*, 27 rue du Mont-Thabor.

[247] F. Joliot, 1946, quoted by M. Pinault, *op. cit*., p. 349.

[248] Preface by F. Joliot, Georges Soria, *La France va-t-elle devenir une colonie américaine ?, op. cit*., p. 5.

to ensure that America did not achieve a monopoly. Yves Farge proclaimed that coal and oil had generated "the fiercest competition ever witnessed in the history of mankind".[249]

Frédéric Joliot embraced the communist approach, which, although fully under the thumb of the Moscow regime, presented a strictly national, and even nationalist, perspective on these issues. Joliot reaffirmed this at the end of the first class he taught at the *Collège de France* in early May 1950, just days after his dismissal on 28 April 1950, portraying himself as the champion of patriotism:

> "Here I am, a Chair of the *Collège de France* where we do science. Science is vital to our country. A power only justifies its independence by the original things it is capable of giving others. Otherwise, it is colonised. This is the essence of national defence – giving citizens the resources to create. It is by patriotism that scientists must develop their ideas and inform their fellow citizens of the role of science."

Insisting on this extension of the notion of "national defence" most likely made reference to the petition drawn up by those close to him (including Perrin, Kowarski and Guéron) on 28 April 1950 (the day of his dismissal), who maintained that the CEA had nothing to do with defence:

> "In contrary to regrettably widespread opinion, the French Atomic Energy Commission is not a National Defence institution and we consider the position of High Commissioner should in no way infringe upon his right to freedom of expression."[250]

This paradoxical situation reflects the contradiction in which Joliot-Curie found himself through his unconditional alignment with Moscow, without perhaps understanding that this trapped him in an aporia, which perhaps led him to lie to himself.

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Joliot-Curie's dismissal was not solely due to his support for the Soviets and his involvement in the Stockholm Appeal calling for an absolute ban on nuclear weapons, but also to his hostility to the creation of the European Council for Nuclear Research (CERN), which the Americans wanted in order to better offset French nuclear autonomy and its potential power. Here is another paradox of his dismissal. Three years later, in 1954, Pierre Mendès France, in great Gaullist spirit, explained that France needed to remove itself from a situation where it was divested of tools for independence and power. The idea of deterrence began to emerge and pave a way in the minds of leaders. The military had seen this coming; for example, Vice-Admiral Castex,[251] or General Pierre Marie Gallois who considered that France was "now too weak to defend itself using traditional methods".[252]

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[249] Yves Farge, *La guerre d'Hitler continue*, *op. cit*., p. 34.

[250] Pierre Biquard, *op. cit.,* p. 117.

[251] Amiral Raoul Castex, "Aperçus sur la bombe atomique", *Revue de Défense nationale*, October 1945.

[252] Pierre Marie Gallois, *Le Sablier du siècle. Mémoires*, L'Age d'Homme, 1999, p. 351. Also see: Dominique Mongin, *La bombe atomique française, 1945-1958*, Brussels, Brylant, 1997; Olivier Forcade, Eric Duhamel, Philippe Vial (ed.), *Militaires en République : les officiers, le pouvoir et la vie publique en France*, Publications de la Sorbonne, 1999, p. 91-92.

The men who had created the CEA and contributed to its construction were all involved, to differing extents, in preparing for the war. The brightest and those closest to Joliot-Curie had contributed to research with a clear military dimension. This dimension was later hidden, but was very real from 1939. When the CEA was created in October 1945, the military objective was not excluded, but was not a priority. This is why the founding text outlined: “Scientific and technical research aimed at applying atomic energy in various scientific, industrial, and National Defence domains”. Due to their involvement in the war, French nuclear physicists were fully aware of the geopolitical impact of their research, whether in military or civil nuclear programmes. The civil and applicative orientation of atomic research during the early years of the CEA was in pursuit of a purpose closely associated with “national defence”.

However, as Joliot proclaimed in his speech at the *Collège de France*, national defence had multiple facets, not all governed by the military. For nuclear physicists in the immediate post-war period, the national priority for atomic research was, first of all, to ensure France’s energy independence and to re-establish its power so that it could play its role and shine on the international scene. The war and culture of engagement had proven French reformist scholars right as they had sought to change the way in which research was conducted in France as early as the 1930s, calling for the age of technoscience. The experience of war and the emergence of a geopolitical conscience were the matrix that led to the invention of new ways of structuring science to bring together public/industrial players, the military/scientific/political sectors and disciplines that were not used to working together, but which now sought to work together to find the path to collective innovation. The CEA is the physical manifestation of this shift, which Raoul Dautry called the era of “creators” working “for the Idea”.

1.4. Louis Rapkine and the Free France scientists at the dawn of the Atomic Age

Diane Dosso[*]

On 21 June 1940, the two directors of the *Centre national de recherche scientifique* (French National Centre for Scientific Research – CNRS),[253] Henri Laugier and Henri Longchambon, arrived in London from Bassens near Bordeaux, travelling aboard the English cargo ship *SS Broompark*.[254] Longchambon was director of the "applied research" section and Laugier was director general and director of the CNRS pure research section. Carrying a mission order from the Ministry of National Defence and War,[255] they took the necessary documents with them to continue work conducted in France on atomic energy in England. The *SS Broompark* also transported Frédéric Joliot's colleagues from his *Collège de France* laboratory, Hans Halban and Lew Kowarski, both physicists who had been granted French nationality in April and November 1939 respectively.[256] Holding a mission order from the French Ministry of Armaments.[257] these two nuclear specialists transported the global stock of heavy water[258] in order to keep it out of the hands of German troops and contribute to British research. Chemist Bertrand Goldschmidt, their future colleague, would later explain that, "due to the exceptional nature of their mission, Halban and Kowarski considered themselves to be special envoys".[259] They therefore kept their distance from Free France and only informed de Gaulle's organisation of their existence in August 1940. It was from this date that the English authorities agreed "to employ them and give them working resources".[260] They became

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[253] The CNRS was created by the Decree of 19 October 1939 (Official Journal of 24 October 1939). The CNRS took over from the *Centre national de la recherche scientifique appliquée* (National Centre for Applied Scientific Research – CNRSA, 1938), *Service central de la recherche scientifique* (Central Service for Scientific Research – 1936), *Caisse nationale de la recherche scientifique* (National Fund for Scientific Research – also "CNRS", 1935) and *Conseil supérieur de la recherche scientifique* (High Council for Scientific Research, 1933).

[254] "I left Bordeaux with Longchambon on 18 June, a few days before the armistice. We arrived in London with a few colleagues on a cargo ship. Despite any issues between France and England, I received, indeed we received, a stirring welcome", Paris, *Musée de l'Homme* Archives, Paul Rivet's Letters, Ms 1/4434, Letter from Laugier, 19 July 1941.

[255] Document no. 27, p. 71-72 in Catherine Nicault and Virginie Durand eds., *Histoire documentaire du CNRS*, Tome 1, *Années 1930-1950*, Paris, CNRS Éditions, 2005.

[256] Hans Halban (1908 Leipzig, Austria – 1964) was granted French nationality by Decree of 17 April 1939 (Official Journal of 23 April 1939); Lew Kowarski (1907 St Petersburg, Russia – 1979) was granted French nationality by Decree of 16 November 1939 (Official Journal of 26 November 1939). During Jacques Allier's secret mission to Norway (March 1940) to recover its stock of heavy water and transport it to France, both were arrested; Halban in the Fort of Porquerolles and Kowarski in the Citadel of Belle-Île. See Dominique Mongin's contribution to this book.

[257] Handwritten mission order dated 16 June 1940, reproduced in this book and transcribed on p. 104, in Bertrand Goldschmidt, *Pionniers de l'atome,* Paris, Stock, 1987.

[258] Representing 26 canisters (185 kg) attached to a raft behind the cargo ship with the hope that it would resist a potential torpedo attack. See Jean Marin, "L'Épopée de l'eau lourde"*, Revue de la France Libre*, nos. 43 and 44, December 1951 and January 1952, p. 4-10; p. 6-13.

[259] Goldschmidt, *op. cit.*, p. 142-143.

[260] *Ibid.*

temporary British agents of the Department of Scientific and Industrial Research (DSIR)[261] and joined the Cavendish Laboratory in Cambridge, where they contributed to British research on the atomic bomb.[262] Chemist Jules Guéron followed them there in December 1941 and joined the Free French Forces on 25 June 1940.[263] In addition to these scientists, around thirty officers and civil engineers worked at the *Service technique de l'Armement* (STA – Technical Armaments Service), managed in London by André Labarthe[264], or were assigned to English laboratories, mainly in Cambridge and Oxford.[265]

On 8 July 1940, Marshal Pétain announced that diplomatic relations between France and the United Kingdom would be severed following the tragic events at Mers-el-Kébir (3 July), putting an abrupt end to efforts on both sides of the Channel to organise France's scientific contribution to the British war effort. For personal reasons, Longchambon returned to France on the last boat repatriating France's embassy services to London. Laugier therefore did not leave for the USA with Longchambon as initially planned,[266] but with biochemist Louis Rapkine, who had been in London since January 1940.[267] In 9 July, Laugier wrote to his "dear friends at the Rockefeller Foundation":

> "In France, there are currently a large number of men in science who will be persecuted and whose intellectual activity will be reduced to nothing. If the best of them, the Joliots, Augers, Langevins, Moricards and others could resume work in America, a

[261] The National Centre for Applied Scientific Research (*Centre national de la recherche scientifique appliquée* – CNRSA) was created on 24 May 1938 (Official Journal of 25 May 1938) on the model of the British DSIR founded in December 1916. The representative of DSIR at the British embassy in Paris was Lord Suffolk, who encouraged the French to board the Broompark. He died on 12 May 1941 when a bomb he was trying to disarm exploded.

[262] First known by the name of the "MAUD Committee" (April 1940 under the British Ministry of Aviation) and then by the code name of the "Tube Alloys Project" (15 May 1941).

[263] In August 1940, Guéron was assigned to Professor Egerton, Physical Secretary of the Royal Society, and Chair of Chemical Technology at Imperial College in London. He returned from the United States on 13 June 1940. In May and June, he had visited laboratories and plants as scientific advisor for the New York Procurement Policy Board Powders Mission (p. 598 in Étienne Roth, "Jules Guéron", p. 596-611 in *Les professeurs du Conservatoire national des arts et métiers. Dictionnaire biographique 1794-1955,* INRP-CNAM, 1994).

[264] The STA was created on 1 July 1940 under the civil services of Free France HQ. In November 1940, Labarthe resigned as director to found the monthly journal *La France Libre* with Raymond Aron. For more information on Labarthe, see Robert Belot, "Un militant de la mobilisation technoscientifique par temps de guerre : André Labarthe, de la création du 'CNRSA' à la bombe atomique", art. cit.

[265] For information on the start of *Free France* in London, see Diane Dosso, "De Gaulle, les savants et la recherche scientifique", p. 548-563 in *De Gaulle chef de guerre. De l'Appel de Londres à la libération de Paris, 1940-1944,* Paris, Fondation Charles-de-Gaulle – Plon, 2008.

[266] "Longchambon and I came to England to ensure this rescue operation." Tarrytown (New York), Rockefeller Archive Center (RAC), Record Group (RG) 1.1, Series (S) 200, Box 51, Folder 604, handwritten letter (in French) from Henri Laugier, 9 July 1940.

[267] After being granted French nationality on 28 September 1939, Rapkine strove to make himself useful to his country under threat while waiting to be called up (with the class of 1940). From mid-January 1940, he worked for the *Mission française des charbons* (French Coal Mission) and then on 11 May 1940, the CNRS director entrusted him with an information assignment to develop the Franco-British scientific collaboration in biological chemistry and experimental biology. He was the only Frenchman working with British colleagues to write an anonymous book titled "Science in War", published in July 1940 by Penguin Books, which encouraged the active contribution of scientists to national defence. See Diane Dosso, "Rapkine Louis", p. 704-705 in *Dictionnaire des étrangers qui ont fait la France,* under the supervision of Pascal Ory, Paris, Robert Laffont, [collect. Bouquins], 2013.

> priceless intellectual capital would be saved. And this would be a great and noble act".[268]

Later on, Laugier discussed "this work to save French intellectualism".[269] It was therefore at Laugier's personal request and on the express recommendation of two members of the Royal Society, Archibald V. Hill and William H. Bragg[270] that the Rockefeller Foundation invited Henri Laugier and Louis Rapkine on a three-month assignment to the USA, which, in reality, well exceeded the initial time frame. The staff at this charitable foundation presumed that Rapkine would be Laugier's interpreter. Laugier was 52 years old in 1940 and spoke little English, unlike Rapkine who, at 36, was fully bilingual. They wanted to ask them about the situation of scientists hiding out in France or England, hoping to collect recent, first-hand information that could help them in their sensitive task of selecting the beneficiaries of their grants. Allocation of these funds was agreed by vote on 31 July 1940. Remember that neither Laugier, former director of the CNRS, nor Rapkine, former fellow of the International Education Board,[271] were strangers to the Foundation. The aim of the Rockefeller Foundation was to lastingly enrich the United States through the European elite fleeing the Nazi threat. They were not looking to save lives, but to safeguard outstanding intellects.[272] This was also Laugier and Rapkine's aim, at a time when unprecedented world conflict had just begun.

1.4.1. New York, August 1940 – Development of a plan by Laugier and Rapkine to save French scientists with the support of the Rockefeller Foundation

On 26 August 1940, Laugier and Rapkine landed in New York from London, after a technical layover in Lisbon for a few days.[273] They then attended regular interviews with the various managers of the Rockefeller Foundation, who soon realised that Laugier and Rapkine were not only there to provide information: they wanted to continue in America what had begun in the UK, and bring French scientists to America. On the one hand, they wished to save them from the risk of forced collaboration with the Nazis, which required removing scientists and

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[268] Tarrytown (New York), RAC, RG 1.1, S 200, B 51, F 604, Letter from Laugier to the Rockefeller Foundation, 2 p., 9 July 1940.

[269] *Ibid*. Rapkine declared that he had saved a part of "French scientific heritage". Pasteur Institut (IP) Archives, Rapkine Fund, RAP 7, Letter from Rapkine to Pleven, 18 August 1941.

[270] Tarrytown (New York), RAC, RG 1.1, S 200, Box 51, Folder 604, telegram from William H. Bragg and Archibald V. Hill to Daniel P. O'Brien, Rockefeller Foundation, 26 July 1940. Furthermore, in March 1940, A.V. Hill was sent to Canada and the USA by the scientific advisor to the Ministry of Air, Henry Tizard. The aim of his mission was to secure the scientific support of the USA on defence issues. This first successful mission facilitated the famous "Tizard Mission" in August 1940 during which the British supplied the Americans with various innovations (cavity magnetron, asdic radars, proximity fuse, rockets, aircraft identification techniques, etc). See Guy Hartcup, *The challenge of war: Britain's scientific and engineering contributions to WWII*, New York, Taplinger Publishing Company, 1970; Margaret Gowing, *Dossier secret des relations atomiques entre Alliés 1939-1945* (Britain and atomic energy, 1939-1945), Paris, Plon, 1965. See Diane Dosso, "Sciences et scientifiques (États-Unis, Grande-Bretagne, France)", 2015, p. 1195-1200, in *Encyclopédie de la Seconde Guerre mondiale*.

[271] The International Education Board (IEB) was created in 1923 and disappeared in 1928 during restructuring of the Rockefeller Foundation (1913) into five departments: international health, medicine, natural sciences, social sciences and humanities.

[272] See Diane Dosso, "La Seconde Guerre mondiale et l'exil des scientifiques aux États-Unis", p. 105-124 in *L'Argent de l'influence. Les fondations américaines et leurs réseaux européens,* under the supervision of Ludovic Tournès, Paris, Autrement Éditions, 2010.

[273] Required by their seaplane.

also their families to prevent blackmail. On the other hand, it was vital to prevent the interruption of their professional activity. From his own experience, Rapkine knew that being cut off from laboratory life for too long could prevent one from returning. Laugier and Rapkine believed that allowing scientists to continue their work would prepare them for a contribution to the future reconstruction of French scientific research, something they were aware of from back then. Laugier and Rapkine needed to keep their visit to New York under wraps, especially as it was unfortunately announced in the 27 August edition of the *New York Times.* Together, Laugier and Rapkine formed a plan to save the French scientific elite, with the discreet yet determined support of the Rockefeller Foundation. This foundation was the perfect partner as it had just adapted its policy in line with the new wartime context, in collaboration with the State Department. Refugees had already come to New York in the past when they required help. Now it was refugees fleeing Europe that needed assistance. From 1940 to 1945, the Rockefeller Foundation introduced two aid programmes, Aid for Deposed Scholars and the Emergency Program for European Scholars. It also supported 111 individuals of around ten or so nationalities, including 34 French nationals. Of the 34 French people saved, 14 worked in the field of natural sciences,[274] including physiologist Henri Laugier and physicists Pierre Auger and his brother-in-law Francis Perrin.

The plan drawn up by Laugier and Rapkine was unique in that it was legal. The United States was not at war and recognised the Vichy government. They therefore kept their ambassador to Marshal Pétain, Admiral Leahy, and the Vichy Regime also had an accredited ambassador in Washington, Gaston Henry-Haye, former mayor of Versailles. Laugier and Rapkine wagered that, in order to maintain good relations with the American government, Pétain would not oppose high-level scientists leaving France, provided that the invitation was for a short duration. They were convinced that Pétain would grant an exit permit to each scientist in the name of maintaining international intellectual cooperation, without which they would be unable to leave the territory legally. The legality of this process gave a certain reassurance to French scientists, but not to foreign nationals who had to find illegal means of travel.

The difficulty in leaving France varied depending on the period in question. New laws were appearing month on month. Furthermore, application of the various regulations fluctuated, partially depending on the period and partially on the individuals responsible for enforcement. But the various steps in the emigration plan did not change. Scientists needed to obtain an invitation from an American institution, an exit permit to leave French territory, two affidavits (character and financial), an American visa, transit visas, a boat ticket and, finally, authorisation from foreign exchange control to export currency.

[274] Namely, Henri Laugier, Wladimir Liberson, Ervand Kogbetliantz, Pierre Auger, Léon Brillouin, Théophile Cahn, Boris Ephrussi, Emil Gumbel, Charles-Philippe Leblond, Charles Oberling, Francis Perrin, Salomon Rosenblum, André Weil and René Wurmser. Nine of them, over two-thirds, were on the list drawn up by Laugier and Rapkine on the request of the Rockefeller Foundation.

The American invitation had to come either directly from a university, or from the New School for Social Research,[275] an institution led by Alvin Johnson[276] and funded secretly by the Rockefeller Foundation. This process avoided successful applications from "exceptional" scholars increasing the number of applications from less illustrious individuals. Unlike the Rockefeller Foundation, the New School did not have the reputation of having unlimited resources. However, an invitation from a social science school could raise suspicions, especially for scientists working in natural sciences, the only scientists involved in Laugier and Rapkine's plan. The Rockefeller Foundation emphasised the need to limit the process to exceptional cases. For example, an invitation from the New School was used for mathematician André Weil (the brother of philosopher Simone Weil). Another disadvantage of this solution was the fact that the invitation was fictitious. Scientists could leave France but then had to look for work after arriving in the USA. University invitations were therefore preferred. However, there was an atmosphere of antisemitism and xenophobia due to the huge numbers of exiles from Europe since the 1930s, primarily Jews. In the face of these difficulties, Laugier and Rapkine decided to personally visit professors they already knew, and university presidents recommended by British scholars. The Rockefeller Foundation financed these trips but requested that its name not be mentioned. Many invitations were obtained through these meetings. They then had to inform the beneficiary to ensure that they would accept this proposal of temporary exile. It sometimes took several months to locate scientists as international communication between the USA and unoccupied France was prohibited. The Rockefeller Foundation's Lisbon office often served as a valuable intermediary. While Laugier and Rapkine were working from New York – something French scientists knew nothing about – some who were feeling threatened wrote at their own initiative to their American friends and colleagues requesting an invitation.[277]

University professors and academics were entitled to non-quota visas, whether or not they were Jewish, making it easier to enter the USA. To qualify, they needed the promise of a two-year employment contract, paying at least $2,500 per year, and proof of having held a teaching position for at least two years prior to the application. Evidently, while the State Department preferred long residencies in the hope of these renowned refugees remaining definitively in the United States and contributing to its scientific development, the French planned for a short stay. Academics applying for an exit permit needed not to give the impression of fleeing their homeland, but of simply leaving for a few months on an official assignment, contributing, as in the past, to France's prestige by representing the nation overseas. Nothing could suggest that this was actually an exile and no-one knew how long it would last. The argument of a short stay was not just tactical for relations with Pétain. Unlike German or Austrian emigrants, the French did not intend to remain definitively in America. They planned to stay there

[275] Peter M. Rutkoff, and William B. Scott, *New School. A History of the New School for Social Research*, New York, Free Press, 1986. Krohn, Claus-Dieter, *Intellectuals in Exile: Refugee Scholars and the New School for Social Research*, University of Massachusetts Press, 1993.

[276] Alvin Johnson, *Pioneer's Progress, an Autobiography*, The Viking Press, 1952. Anne-Marie Duranton-Crabol, A*lvin Johnson et Varian Fry. Au secours des savants et artistes européens, 1933-1945*, Michel Houdiard Editeur, 2002.

[277] For example, this was the case of Léon Brillouin on 25 August 1940 and Edmond Bauer on 30 September 1940.

temporarily in order to stay alive (particularly if they were Jewish) and/or to continue their research without the risk of forced collaboration with the enemy. In the end, the following subterfuge was developed: the Americans spoke of a one-year invitation in its correspondence with the French Embassy in Washington or with French ministries. The invitations sent to the American consulates in France, however, specified the true duration (two years) so that the scientists could obtain an American visa.

Finally, Laugier and Rapkine accepted the crippling responsibility that the Rockefeller Foundation had refused to shoulder, drawing up a list of French scientists to welcome to America. This five-page document was not destroyed despite its authors' instructions. Scientists were split into six disciplines of natural sciences, in the following order: mathematics, physics, biochemistry and biophysics, biology, physiology and chemistry. Two categories of scientist were drawn up for each discipline: those of exceptional quality to get out of France as a matter of urgency – these names were underlined and on the "first list", including Frédéric Joliot and his wife; those of lesser quality or who were beyond the age of high intellectual productivity, formed the back-up list ("second list"), which was used if certain scientists could not or did not want to leave France. We can therefore reconstitute two lists with 34 and 60 names respectively. The main criterion in the selection of an individual was clearly his or her scientific value. They then considered whether or not the person was Jewish, in any particular political danger, and his or her age. Finally, they determined whether or not the individual wanted to leave France. Some, like Frédéric Joliot, Henri Cartan, André Lwoff and Edgar Lederer refused the exile they had been offered.

Once in possession of an exit permit from France, scientists needed to obtain an American visa. They first needed to reach one of the American consulates in the "free" zone in Lyon or Marseille. To cross the demarcation line, they needed to be in possession of an *Ausweis* (pass), which only the Germans could issue, sometimes only after a long delay.[278]

Francis Perrin, the son of Jean Perrin, had been involved in Joliot's team's research at the *Collège de France* since April 1939. With Halban, Joliot and Kowarski, he had signed the three patents filed in spring 1939.[279] On 10 December 1940, the Rockefeller Foundation voted to approve a $6,000 grant for Columbia University (New York) to invite Francis Perrin to join its Chemistry Department for two years from 1 January 1941.[280] Thanks to this grant, F. Perrin received an annual salary of $2,500 and the remaining sum covered the travel costs of Perrin and his family (his wife and three children). On 27 December 1940, four days after the invitation from the president of Columbia University (New York) was sent to Perrin, Henry-Haye sent his "most favourable opinion" in support of this request to the *Service des Œuvres*

[278] From 4 October 1940, a German order set out the sanctions applied to those crossing the line without authorisation; see Alary, Eric, *La ligne de démarcation,* Paris, Perrin, 2003. Réédition [collection Tempus], Perrin, 2009, p. 48.

[279] 1 May 1939, patent on an "energy generation system" (nuclear fission), 2 May 1939, patent on a "stabilisation process" for the previous system (neutron moderator), 4 May 1939, patent on the "development of explosive loads" (atomic bomb).

[280] Tarrytown (NY), RAC, RG 1.1, S 200 D, Box 133, Folder 1648, "Grant in aid", 10 December 1940.

(Office of Works).[281] Surprisingly, this Washington ambassador, who was known for his loyalty to Pétain's government, supported the plan to save French scientists, probably without even realising it. Letters to the director of Higher Education highlighted the interest in scientific collaboration between French and American institutions, and this argument bore fruit. When issuing permission to leave for the USA to Auger and F. Perrin, who had both returned to France in autumn 1940 to resume their teaching, the French authorities clearly expressed their desire to see them remain within the law.[282] To cross the demarcation line legally, in April 1941, Auger successfully requested authorisation from the Ministry of National Education on the pretext of returning to the Pic du Midi observatory in the Pyrenees for his research, as in previous years. In the unoccupied zone, he was free to organise his departure. Boris Ephrussi, on the other hand, had no other solution than to illegally cross the demarcation line, fortunately successfully. After giving lessons at the Henri Poincaré Institute for around one year, Francis Perrin was summoned by the rector in May 1941 and he thought his time of reckoning had come. In reality, Jérôme Carcopino informed him of his invitation from the Americans.[283] Over the summer, he also successfully secured an appointment to the Pic du Midi laboratory in the "free zone" and was able to begin procedures in Vichy to obtain an American visa. Thanks to his service passport, he did not have to wait for authorisations from Madrid and Lisbon to obtain Spanish and Portuguese visas.

For entry onto US territory,[284] an emergency visa programme for political refugees was implemented in 1940. This was managed by the President's Advisory Committee on Political Refugees, led by George Warren, which reported directly to President F.D. Roosevelt. However, the laws governing entry into the United States became more restrictive for all categories of individuals in summer 1940. The more rigorous entry procedure resulted in very long checks. From then on, applications needed to be submitted via Washington rather than directly to local consulates. Two affidavits for character and finances became necessary (i.e. two American guarantors) instead of one. The following year, new regulations came into force. Anyone with close family in Italy, Germany or an occupied country (including the occupied zone in France) could no longer obtain an American visa. Without Rapkine's work in Washington, these new measures could have prevented Auger and F. Perrin from leaving France. However, they did not apply to native French people. Finally, American consulates were no longer authorised to issue visas without special authorisation from the State Department.[285] Little by little, the United States closed the doors to those fleeing the persecutions and massacres carried out in Europe. In summer 1940, Portuguese and Spanish consulates granted the transit visas required to reach Lisbon upon presentation of a visa for

[281] Paris, MEAE, Guerre 1939-1945, Vichy-Œuvres, box 67, 0.160.2, telegram from Gaston Henry-Haye, 27 December 1940. The request also involved Henri Cartan.

[282] Tarrytown (NY), RAC, RG 1.1, S 216 D, Box 8, Folder 99, Letter from C. F. Rey, 8 April 1941.

[283] Interview with his wife, Colette Perrin, on 1 July 1994 in Paris 14th *arrondissement* (in the presence of Michel Pinault).

[284] Catherine Collomp, "La porte étroite. Immigration et refuge politique aux États-Unis, années 1930-1945", p. 75-94 in Collomp, Catherine and Menendez, M. (ed.), *Exilés et réfugiés politiques aux États-Unis, 1789-2000*, CNRS Éditions, 2003.

[285] The Russel Act came into force on 1 July 1941.

America or any other overseas country. In early October 1940, the process for issuing these transit visas was modified. Consulates then needed to directly refer to their ministries in Lisbon and Madrid. After checks, the visa was only issued in the passport a few days before the scheduled boarding date. It therefore became almost impossible to have all the necessary visas within the same period of validity![286]

> "This was the gate to America. If you couldn't reach it, you were lost, condemned to bleed away in a jungle of consulates, police stations and government offices, where visas were refused and work permits unobtainable, a jungle of internment camps, bureaucratic red tape, loneliness, homesickness, and withering universal indifference. As usual in times of war, fear and affliction, the individual human being had ceased to exist; only one thing counted: a valid passport".[287]

Throughout the procedure of receiving an invitation and leaving France, Rapkine worked in liaison with staff at the Rockefeller Foundation.[288] For each scientist selected, he wrote a detailed record of biographical information, explaining the interest of his/her research and drawing up a list of publications. Finally, he took legal responsibility as guarantor before the immigration authorities. He regularly travelled to Washington to convince George Warren that a specific scientist's case did indeed precisely meet requirements and that he or she required an emergency visa. Although Rapkine did not receive a salary and had refused various research positions to dedicate himself fully to the emigration of the French scientific elite, he managed to establish a fund to support them.[289] The sums collected covered the travel expenses of those who had obtained emergency visas and formed a reserve fund to support new arrivals and help them overcome any associated difficulties.

1.4.2. New York, December 1941 – creation of a scientific bureau led by Louis Rapkine as part of the Free France Delegation to the United States

In spring 1941, General de Gaulle sent René Pleven on assignment to the USA. He trusted him and gave him full power to act on his behalf.[290] Pleven not only set up a Free France Delegation to the US, but also ensured that it was recognised by the Washington authorities. However, relations between Free France and the US remained confrontational. For the American

[286] See Jean Malaquais's story (1908-1998) in his novel titled *World Without Visa,* which takes place in Marseille in the early 1940s **(**Malaquais, 1947 and 1999).

[287] Erich Maria Remarque, *La Nuit de Lisbonne* (The Night in Lisbon)*,* Le Livre de poche, 2013, p. 8.

[288] See Diane Dosso, "The Rescue of French Scientists. Respective Roles of the Rockefeller Foundation and the Biochemist Louis Rapkine (1904-1948)", in Giuliana Gemelli (ed.), *The 'Unacceptables'. American Foundations and Refugee Scholars between the Two Wars and after*, PIE-Peter Lang, Brussels, 2000, p. 195-215.

[289] This was mainly comprised of gifts from wealthy French men and women also in exile in the USA, including Paul, Pierre and Jacques Wertheimer (Bourjois perfumery), Edouard, Guy and Bethsabée de Rothschild, Claude Bernheim, Horace Finaly, etc. From, 1941, this fund was known as the French Scholars' Fund.

[290] "All Free French in the United States must obey your orders – as they are also mine." National Archives, Papiers René Pleven, 560 AP 25, Folder 2, Telegram from General de Gaulle to Pleven, from Francom, Cairo, 3 June 1941.

administration, de Gaulle was no more than an apprentice dictator whom they distrusted. Pleven arrived in June but extended his stay until October due to the complexity of his task.

It is worth stating that neither Laugier nor Rapkine had joined General de Gaulle at this time despite being in London in June 1940. Laugier was a freemason, anti-military and anti-fascist, close to radical Yvon Delbos, for whom he had served as chief of staff six times between 1925 and 1940, and was not drawn to the personality of the leader of Free France. In Paris in 1936, Rapkine had founded the *Comité français pour l'accueil et l'organisation du travail des savants étrangers,*[291] and now pursued his sole objective of engaging scientists in the war effort, which he had begun with his British friends and colleagues. However, their action on behalf of scientists who had remained in occupied France was clearly a form of overseas resistance that they considered not only possible but also desirable. Above all, they were driven by the desire to do their utmost to ensure the success of their rescue mission. Even in the United States, a neutral country, they could not engage openly in Free France and thereby risk compromising scientists still in France and dependent on the French authorities to obtain their exit permits. In February 1941, via the Rockefeller Foundation, Laugier left to teach physiology at the *Université de Montréal* and was relieved to return to work in a French-speaking country. On his suggestion, in December 1942, an unfinished wing in the main building of the French-speaking university was assigned to the atomic project.[292]

In New York, Rapkine continued the rescue mission alone. On 7 August 1941, Pleven met Rapkine in Washington for the first time at a particularly opportune moment. On 13 June, Rapkine had welcomed his wife Sarah and nine-year-old daughter to New York after over one and a half years of physical separation in which they had not even been able to communicate by letter. With his family finally by his side, he no longer risked blackmail by the Nazis. He was now free to publicly engage in Free France. The emigration plan he had established with Henri Laugier was working. In August 1941, ten or so scientists had already come to the USA and around fifteen others were expected. Rapkine's self-imposed objective was to organise the collaboration of scientists in exile from France in American National Defence, i.e. the Allied war effort. He wrote to Pleven after their meeting, confirming that "we are seeking to bring together all French scientists (including certain Polish, Czech, Austrian, Italian and German refugees who have contributed to French scientific activity and who, upon declaration of the war, chose to side with the French) within a single group to contribute to research and problems associated with the war".[293] Pleven then proposed that Rapkine take over

[291] French Committee for the Welcome of, and Organisation of Work for, Foreign Academics. See Sébastien Balibar and Diane Dosso, "Savants réfugiés : comment, à Paris en 1938, la physique quantique devint visible à l'œil nu", p. 161-182 in *Migrations, réfugiés, exil,* under the supervision of Patrick Boucheron, Odile Jacob, 2017. This work contains contributions to the conference held at the Collège de France in autumn 2016. On the initiative of Thierry Mandon, State Secretary for Higher Education and Research, the National Program for the Urgent Aid and Reception of Scientists in Exile (*Programme d'Aide à l'accueil en Urgence des Scientifiques en Exil – PAUSE)* was established on 16 January 2017, following on from the committee founded by Rapkine under the Popular Front. More information is available online at the Collège de France website: URL: http://www.college-de-france.fr/site/en-program-pause/index.htm.

[292] Bertrand Goldschmidt, "L'apport de la France Libre à l'effort atomique anglo-saxon" in *La Revue de la France Libre,* no. 149, March-April 1964. URL: http://france-libre.net [visited on 13.04.2018].

[293] IP Archives, Fonds Rapkine, RAP 7, Letter from Rapkine to Pleven, 18 August 1941.

management of a "bureau for scientists". He took this opportunity to associate the action of Free France with the prestige of famous scholars such as Jean Perrin (Nobel Prize in Physics in 1926) and mathematician Jacques Hadamart. Rapkine sought to bring them to America without the support of the Rockefeller Foundation, as these two academics, aged 71 and 76 respectively, did not meet the criteria of its emergency aid programme. However, they both had the experience of the First World War where their work had played a key role in speeding up Allied victory. In the hope that inventions or arms could emerge from their research and influence the course of the current global conflict, Pleven became fully committed to Rapkine's extraordinary approach.

In November 1941, the Americans authorised the British to include Free France in the Lend-Lease Act passed by Congress in March. Over time, the Gaullist organisation saw an improvement in its material resources. On 4 December, Adrien Tixier was confirmed in his functions as head of the Washington Delegation, which was now under the authority of the French National Committee in the United States.[294] Two days later, he sent a cable to obtain London's opinion on the potential creation of a "Bureau of French Scientists".[295] After official engagement in the Free French Forces (FFL), scientists could be sent on special assignment to the American authorities, meaning that scientists employed by American National Defence could still remain under de Gaulle's control. On the same day, Vannevar Bush, director of the Office of Scientific Research and Development (OSRD),[296] tasked a group of American physicists with development of the atomic bomb. Nuclear research efforts in the United States intensified.[297] Finally, it is important to mention the role played by Eve Curie with regard to President Franklin Delano Roosevelt and his wife Anne Eleanor, mentioned by Bertrand Goldschmidt in his memoirs.[298]

Official, signed recognition from General de Gaulle dates back to 11 December 1941. The *Bureau Scientifique* (Scientific Bureau) was created and Rapkine was appointed director. General de Gaulle asked to receive each application so that he could make the final decision.[299] This was the first official recognition of Rapkine's work in support of French scientists. For supporters of General de Gaulle, the creation of this kind of body in the United States was an important step in the long process leading to the political recognition of the Free French by

[294] Created in London by the Order of 24 September 1941 with eight national commissioners. René Pleven was responsible for the economy, finances and colonies.

[295] IP Archives, Fonds Rapkine, RAP 7, Cable from Tixier to "Free France" on 6 December 1941.

[296] Vannevar Bush (1890-1974), an engineer by training, was president of the Carnegie Institution of Washington (1938), and then director of the National Defense Research Committee (NDRC), created on 15 June 1940, and finally of OSRD founded on 28 June 1941. He was the key man for scientific engagement in the war in the United States and was in direct contact with Roosevelt and then Truman.

[297] In September 1942, under the supervision of General Leslie Groves, it received its code name, the "Manhattan Project".

[298] Ève Curie (1904-2007) was the sister of Irène Joliot-Curie (1897-1956). Ève Curie said to Bertrand Goldschmidt: "The issue to which you refer (guarantee given to French scientists potentially used in American national defence research) is very important. I have spoken to Rapkine about this on many occasions. I agree with him that this guarantee must not be individual but collective. A group of French scholars needs to be formed, with the patronage of Free France or de Gaulle if required. This group will assume its responsibilities and take responsibility for its members to the Americans and British. If I can be of any use whatsoever to this kind of group, I will do all in my power to help." in Goldschmidt, *op. cit*., p. 136-137.

[299] IP Archives, Fonds Rapkine, RAP 7, Cable from General de Gaulle to "Free France" on 11 December 1941, in English.

the American authorities. A second step was the creation of the *École Libre des Hautes Études* (Free School for Advanced Studies) in February 1942, which was a real "University of Free France".[300] On 11 December 1941, on the very day that de Gaulle authorised the formation of the Scientific Bureau, Germany and Italy declared war on the United States. The Americans joined the British in their fight against Nazi oppression.[301] Although the USA's entry into the war did not remove their mistrust of Free France, it did facilitate the employment of refugees who could usefully replace Americans who had gone to war.

In late December 1941, Rapkine wrote to scientists to ask them to get behind the idea of the Scientific Bureau. Some had just arrived in the United States. Their answers were quick and enthusiastic; refugee scientists had a strong desire to continue to fight and play an active role in the war through their research. Their exile was not an escape but a continuation of the fight for democracy outside of mainland France, which had been invaded by the Nazis. Belonging to the Scientific Bureau required them to sign an engagement in the Free French Forces[302] and non-French nationals were excluded, against Rapkine's wishes. In addition to the scientists he helped emigrate, he also met with individuals who had travelled to the USA on their own. Some scientists who wished to use their work to contribute to American National Defence contacted Rapkine at their own initiative. The array of disciplines represented within the Scientific Bureau was extended to cover the humanities. It included psychiatry (Rudolph Loewenstein), physics, which was the dominant discipline (Pierre Auger, Léon Brillouin, Ladislas Goldstein, Hans Halban, Pierre Mercier, Jean Perrin, Francis Perrin,[303] Anatole Rogozinski, Salomon Rosenblum, Stanislas and Aniuta Winter), mathematics (Emil Gumbel, Jacques Hadamard, Szolem Mandelbrojt), geography (Jean Gottmann), chemistry (Bertrand Goldschmidt, Michel Magat, Jules Guéron), anthropology (Claude Lévi-Strauss), biology (Boris Ephrussi, Leonid Goldstein, Charles-Philippe Leblond, Nelicia Maier, Sabine and René Wurmser in Brazil), neurophysiology (Haïm Haimovici), medicine (Charles Oberling), physiology (Théophile Cahn, Henri Laugier, Wladimir Liberson, André Mayer). René Planiol and

[300] Classes there included Pierre Auger's on Cosmic rays; Francis Perrin's on the Foundations of quantum mechanics; Henri Laugier's on Biometrics and professional selection in peace and wartime; and classes on the Quantified measurement of the depth of anaesthesia. Other classes included those by Georges Placzek, "Some problems of nuclear physics"; Salomon Rosenblum, "What we learn from radioactivity"; Ignace Zlotowski, "The cyclotron and its applications"; "The energetics of nuclear reactions". All of these subjects had a direct link to current events at the time.

[301] Three days earlier, on 8 December, the American Congress declared war on Japan, which had launched a surprise attack and destroyed the American fleet off the coast of Pearl Harbor one day earlier.

[302] Engagements of Laugier (non-dated), Rapkine (3 March 1942), Goldschmidt (9 March 1942), Auger (20 March 1942), Francis Perrin (18 March 1942) and Halban (6 January 1943). Source: IP archives, Fonds Rapkine: "Free French Delegation to the United States – Engagement. I, the undersigned, approve the decisions of General de Gaulle in refusing to accept the armistice of June 1940 and forming the Free French Forces with a view to continuing the fight alongside Great Britain and her allies until final victory. I declare my association with the 'Free France' movement, whose aim is to restore the independence and integrity of democratic France and her Empire. Furthermore, I oppose the totalitarian regime instituted by the Vichy Government and France's collaboration with the Axis powers, which can only lead to consolidation of France's domination by dictatorships. Consequently, I hereby engage myself in the Free French Forces for the duration of the war and the three months following the end of the hostilities."

[303] Letter from Francis Perrin to Louis Rapkine, 3 January 1942: "Dearest Louis, of course I am ready to take on any engagement in Free France organisations considered useful for the creation of a group of French scientists and technicians in the United States to collaborate on defence or war research for democracies. Best wishes to you", IP Archives, Fonds Rapkine. Francis Perrin was sent on a special assignment by Rapkine to the Canadian Radium and Uranium Corporation (New York) on 21 May 1942, and then on 8 September 1942, to the Electro-Mechanical Research, Inc. *(*Houston, Texas).

Robert Alkan were engineers (Alkan was in the field of aeronautics). Scientists were recruited from 29 January 1942 to January 1943. The Scientific Bureau counted a total of 34 members, plus its leader. The youngest, Gottmann, was 26 years old, while the eldest, Hadamard, was 76. Thirteen of them made it to the United States with the help of Laugier, Rapkine and the Rockefeller Foundation, and 10 with Rapkine's help alone. It is difficult to gauge the exceptional skills of persuasion he must have needed to convince a multitude of emergency committees and foundations and achieve this spectacular result.[304]

In February 1942, Rapkine wrote to the head of the Free French Delegation, Adrien Tixier, to explain that, although the Americans remained wary of the French, he hoped that "like our English friends, they will consider French scientists as colleagues and friends whom they can trust".[305] This was not the case. The scientists were officially under Free France from December 1941, but only started to be authorised to work for American National Defence from 21 May 1942, with: Claude Lévi-Strauss in the War Department, Aniuta Winter in a public health laboratory, Francis Perrin and Ladislas Goldstein in the Canadian Radium and Uranium Corporation. They were joined on 23 July 1942 by Michel Magat, for research into synthetic rubber at Princeton, Salomon Rosenblum for the Canadian Radium and Uranium Corporation, and Bertrand Goldschmidt, who worked on radiochemical problems with the British government. These special assignments were independent of the positions held by scientists in American universities. For example, Francis Perrin dedicated only one-third of his time to National Defence, working on a study on an aerial torpedo.

This first success was not enough for Rapkine, who wanted the total participation of all members of the Scientific Bureau in National Defence work. On 12 September 1942, Laugier and Rapkine co-signed a "Memorandum concerning French scientists in North and South America" which they sent to Sumner Welles, American Under Secretary of State. Laugier was writing as Vice-President of France Forever, an association that he took over in spring 1942. His political position had changed considerably. He was now convinced of the sincerity of General de Gaulle's republican convictions and became fully committed to the struggle for Free France. This memorandum was sent with the list of French scientists in the United States who were members of the Scientific Bureau*,* and their biography. The Scientific Bureau was operating like a real employment agency. Shortly afterwards, Rapkine also sent the list of

[304] "It may seem natural and almost obvious that scholars of French nationality, Allied scholars, would have been able to find the means of pursuing their research in the USA or England to contribute to victory. However, this was not the case and Louis Rapkine had to fight tirelessly for each of those he had saved to find a satisfactory role in which he or she could be truly useful. He wanted to give them material comfort and moral satisfaction while keeping them in a group, which was one of the purposes of his plan – his belief that researchers should work together and form a group." Pierre Auger, "Idéaliste et Réaliste", p. 6-10 in Vivian and Benjamin Karp (eds.), *Louis Rapkine (1904-1948),* The Orpheus Press, North Bennington (Vermont), 1988.

[305] "Official" correspondence (Free France), Correspondence between the Scientific Bureau and the Delegation, Letter from Rapkine to Tixier, 16 February 1942, IP Archives, Fonds Rapkine, *via* the British Ambassador to Washington, C. L. Lindemann. Rapkine sent his brother, F. A. Lindemann (the future Lord Cherwell), scientific advisor to Churchill, a report on his actions and the list of members of the Scientific Bureau.

biographies for 37 scientists, 28 of whom belonged to the Scientific Bureau, to the secret services (OSS – Office of Strategic Services) and the Inter-Allied Information Center.[306]

Only eight scientists were on special assignment when Rapkine announced on 3 November 1942 to all members of the Scientific Bureau that the War Ministry military intelligence service was preparing to send them a questionnaire. He explained that "this is an encouraging result which shows that the American authorities are considering the use of French scientists for National Defence problems".[307] Exactly two months later, Rapkine told Aglion the following regarding the contribution of his colleagues to the war effort: "I continue to focus my efforts in this direction, but the going is tough because our American friends consider the fighting French to be 'enemy aliens' with regard to secret war research".[308] From May 1942 to July 1943, only 15 French scientists of the 35 in the Scientific Bureau (including Rapkine), representing just two in five, were on special assignment. It is in this capacity that Pierre Auger,[309] Bertrand Goldschmidt, Jules Guéron and Hans Halban[310] moved to Canada to contribute to the British-Canadian atomic project.[311] Jules Guéron's case was unusual. He moved to London from Brittany with his brother-in-law Étienne Hirsch[312] and was immediately engaged in the Free French Forces. His "Act of Engagement" is dated 25 June 1940.[313] This explains the following extract of a letter from Rapkine to Guéron on 15 June 1943:

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[306] This is how Claude Lévi-Strauss obtained a position as expert advisor to the Latin American Section of the Coordinator of Information from 1 May 1942, while awaiting his special assignment.

[307] IP Archives, Fonds Rapkine, RAP 7, Circular from Rapkine, 3 November 1942.

[308] IP Archives, Fonds Rapkine, RAP 7, Letter from Rapkine to Aglion, 3 January 1943.

[309] Rapkine assigned him to the British DSIR in Montreal on 1 December 1942. "He was responsible for organising the physics department and led and conducted nuclear physics research to prepare for construction of the first heavy water reactor. […] With Bruno Pontecorvo, he developed an important measurement, known as the 'transport mean free path' or distance travelled by slow neutrons in heavy water and graphite. This measurement was required for calculating the exact dimension of uranium reactors with a heavy water or graphite moderator." Extract from the *Académie des Sciences* Secret Committee, 14 March 1949, written by Joliot, cited in Appendices, p. 624 in Diane Dosso, *Louis Rapkine (1904-1948) et la mobilisation scientifique de la France Libre*, Epistemology and History of Science Thesis, Paris 7-Denis Diderot University, 1998.

[310] Special assignment by Rapkine to the British DSIR in Montreal on 13 January 1943.

[311] "In October 1942, when the result of the Battle of Stalingrad and outcome of the war had not yet been determined, the British and Americans decided to transfer the Cambridge group to Canada to strengthen their efforts, thereby creating the British-Canadian atomic project to work on preparing for construction of a nuclear reactor designed to produce plutonium." See Étienne Roth, *art. cit*.

[312] Étienne Hirsch aka "Bernard" (1901-1994) was a civil engineer and officially trained mining engineer. In London, he was assistant director of the *Service technique de l'Armement* (Technical Armaments Service – STA). It was here that Guéron decided to create the Armaments Chemistry Laboratory (*Laboratoire de chimie de l'Armement*), which developed a sabotage guide – a practical guide to making explosive devices at home. The results of this work were sent to the Free France secret services, the *Bureau Central de Renseignements et d'Action* (BCRA). In January 1943, chemist Joseph M. Cathala (1892-1969) replaced Guéron as director of the laboratory after his departure for Montreal. See Diane Dosso, "De Gaulle, les savants et la recherche scientifique", p. 548-563 in *De Gaulle chef de guerre. De l'Appel de Londres à la libération de Paris, 1940-1944,* Paris, Fondation Charles-de-Gaulle-Plon, 2008. From July 1943 in Algiers, Hirsch became a close colleague of Jean Monnet, following him to the *Commissariat general du Plan* (Plan Commission). From 1963 to 1970, he was General Administrator of the CEA. Étienne Hirsch was the grandfather of Martin Hirsch, current director of AP-HP.

[313] *Service historique de la défense* (SHD – Historical Defence Service), Jules Guéron individual file, "FFL – Act of engagement", GR 16 P 275338. A reproduction can be found in the exhibition "*Résistance et dissuasion*" (Resistance and Deterrence) produced in October 2017 by the CEA/DAM. In June 1940, Guéron left without his wife Geneviève (1906-1995), Doctor of Chemistry, and their two young sons, who only joined him in London in autumn 1942, thanks to visas obtained with the help of Louis Rapkine.

> "Following the normal procedure, each scientist's application must be approved by General de Gaulle. However, your case is unique. Firstly, you are already a member of Fighting France; secondly, you have been assigned to the Department of Scientific and Industrial Research by the Fighting France Armaments Service [from December 1941]; and finally, the Delegate from the *Comité National de la France Combattante* (National Committee of Fighting France) sees you becoming a member of the Scientific Bureau as purely advantageous. I have therefore signed you up as a member of the USA Delegation's Scientific Bureau without contacting London. Under these conditions, please consider this letter to be official notification of my sending you on special scientific assignment to the British Government's Department of Scientific and Industrial Research".[314]

Remember that, during the Phoney War, Pierre Auger was appointed head of the Documentation Service,[315] created just three weeks after the CNRS.[316] He introduced the "*Périodique d'Information*" (Information Periodical[317]) for scientists called up or on special assignment across France. Access by laboratory staff to scientific documentation was vital for continuing scientific research during the war, especially for researchers who had been called up and had to keep their information up to date at all costs. Once again, the Rockefeller Foundation provided financial support for the French (purchasing machines for reading microfilms, particularly German journals). Rapkine fully supported Jules Guéron in this constant drive to support the international political recognition of Free France. Guéron received General de Gaulle's permission to form a "Free France" panel for the defence of physicist Maurice Surdin's thesis in London on 26 February 1942, so that it did not need to be conducted by a British university panel.[318] On 11 July 1944, Jules Guéron met with General de Gaulle, president of the Provisional Government of the French Republic (GPRF), during a visit to Ottawa (Canada),[319] secretly informing him of the imminence of the Americans possessing an atomic weapon (no French nationals had been permitted to work on the Manhattan Project), and of the necessity of relaunching French research in this field as quickly as possible once peace had been restored.[320]

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[314] IP Archives, Fonds Rapkine.

[315] The first article of the Order of 2 December 1947 changed its name to the "*Centre de Documentation du CNRS*" (CNRS Documentation Centre), Cachan, *Institut d'Histoire du Temps Présent* (IHTP), ARC 206, CNRS.

[316] On 16 November 1939 to be precise.

[317] Predecessor to the *Bulletin Analytique* (Analytical Bulletin), renamed the *Bulletin Signalétique* (Descriptive Bulletin) in 1957. See p. 23 in Jean Wyart, "La fondation du CNRS et l'information scientifique", *Cahiers pour l'histoire du CNRS,* no. 2, 1989, p. 13-34.

[318] See Georges and Maurice Guéron, *Jules Guéron (1907-1990), Aperçus d'une vie dans un monde en mutation,* Paris, 1992*,* p. 31. A photo shows the thesis defence, in the presence of Andrée Deloyers, Étienne Hirsch, Mrs and Miss Surdin, Joseph Cathala (chair of the panel) and Jules Guéron. Memo that, after the war, Cathala created the *Institut du Génie chimique* (Institute of Chemical Engineering) in Toulouse, which he led from 1949 to 1966.

[319] This was General de Gaulle's first visit to North America since founding Free France.

[320] "I was secretly informed of the imminent completion [of the first atomic bombs] by Pierre Auger, Jules Guéron and Bertrand Goldschmidt, French scientists, who, with my authorisation, had joined the Allied teams working on this apocalypse", in Charles de Gaulle, *Mémoires de guerre. L'Unité 1942-1944,* Livre de Poche, 1960, p. 296.

Despite the many actions carried out by Rapkine to credit Fighting France with the work of scientists working for the Allies,[321] the participation of French scientists in the American war effort remained marginal.[322] This is why French scientists, still led by Rapkine, formed the French Scientific Mission in the United Kingdom (*Mission Scientifique Française en Grande-Bretagne*). They left America for London, arriving shortly after the Allied landings in Normandy (6 June 1944).

*1.4.3. Return to London, August 1944 - the French Scientific Mission in the UK (***Mission Scientifique Française en Grande-Bretagne***), led by Louis Rapkine*

The Mission originated in Rapkine's trip to England in 1943, where he observed the "systematic and direct use of the scientific method for anything associated with war phenomena"[323] – in other words, operational research, which was the British contribution to the Allied victory. Considering "all that France would have to gain",[324] he decided to establish "close collaboration between French scientists and British scholars",[325] who had opened their laboratories to the French. In addition to the creation of operational group cores for each British Ministry of Defence (Admiralty, Air Ministry, War Office), cooperation continued on scientific work in British war laboratories (Ministry of Armament, Home Security, Aircraft Production, Admiralty institutions). Personal contacts and exchanges of publications were resumed for both pure and applied research. As director of the French Scientific Mission in the UK, Rapkine was responsible for the administrative situation of nuclear scientists Hans Halban, Lew Kowarski, Bertrand Goldschmidt and Jules Guéron.[326]

Following the Liberation, Rapkine organised Frédéric Joliot's visit to the UK in September 1944, without first informing his colleagues. Joliot mentioned this impromptu visit to London, after having being appointed director of the CNRS two weeks earlier on 20 August 1944:[327]

> "Rapkine had carefully concealed my arrival [on 4 September 1944]. He wanted to surprise his little group. I found them in their big study room, searching through documents, at the time they least expected to see me again. (…) How could I not be profoundly moved by seeing all these friends? I found my hosts to be neither boastful

[321] "I believe it [special assignment] to be the only means of crediting Fighting France with the work of our scientists in United Nations services [sic]." IP Archives, Fonds Rapkine, Organisational files, Correspondence with scientists, Letter from Rapkine to Robert Alkan, 3 December 1942. The term "United Nations" dates back to the Washington Declaration of 1 January 1942 and "Free France" became "Fighting France" on 13 July 1942.

[322] Diane Dosso, "La France Libre et la politique de recherche. New York, 1941-1944", p. 115-131 in *Le gouvernement de la recherche. Histoire d'un engagement politique, de Pierre Mendès France à Charles de Gaulle (1953-1969)*, La Découverte, 2006, p. 115-131.

[323] Rapport sur la Mission Scientifique Française en Grande-Bretagne (Fin Août 1944-Fin Décembre 1945) par Louis Rapkine, IP Archives, Fonds Rapkine, 23 typewritten pages.

[324] *Ibid.*

[325] *Ibid.*

[326] See Dominique Mongin's contribution to this book.

[327] As a member of the Interior Resistance movement "*Front national universitaire*" (University National Front), Joliot was assigned to this position by Henri Wallon, Minister of Public Instruction.

> nor imbued with a desire to impress or demonstrate foresight. With infinite modesty, they asked me: 'Will we be able to work in France again?' How happy I was to be able to reassure them of this".[328]

In London in autumn 1944, each exiled scholar driven out of occupied France by the racist laws of the Vichy Regime had to request their reintegration "as one of the leaders of Scientific Research".[329]

In September 1944, the meetings of the Anglo-French Society of Sciences resumed after being interrupted by the war. Two plenary sessions (French group and English group) were held in London on 16 and 23 September.[330] On 28 April 1945, two decrees from the French Ministry of War created a "*Service Scientifique et des recherches intéressant l'Armée et les operations militaires*" (Department of Science and Research for the Army and Military Operations).[331] Pierre Auger and Louis Rapkine were the lead scientific advisors and Francis Perrin led the *Groupe d'Études et de Recherches Opérationnelles sur le radar* (Study Group for Operational Research on Radars).[332]

When reporting on the Mission in August 1945, Rapkine announced that 92 scientists had travelled to England, 18 of whom came from the USA, Canada, South America and Portugal, eight of whom were already in England, and 66 "from France since the Liberation; scientists who were unable or who did not wish to leave France during the enemy occupation".[333] On 16 September 1945, one month and one week after Hiroshima and two months before the UNESCO Constitution was signed,[334] Rapkine was invited to take part in the BBC Science Magazine programme, where he spoke as head of the French Scientific Mission.

> "A small number of French scientists managed to leave France during the Occupation. Some came to the United Kingdom and were immediately welcomed by their British colleagues. Some went to the United States of America and others to Canada. All

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[328] Frédéric Joliot-Curie, "La science franco-britannique et la guerre", p. 29-34 in *Dialogue, revue mensuelle franco-britannique* no. 1, July 1946.

[329] For example, Rapkine's application on paper with the letterhead of the French Republic, Provisional Government, National Education Commission, French Scientific Mission in the UK, 1 Carlton Gardens, addressed to the Director of the CNRS, stamped by the *Service Central de la Recherche Scientifique* (Central Service of Scientific Research), 2 November 1944. (CNRS Archives – Gif/Yvette, 910024 DPC); or Michel Magat's application, 23.10.1944 (National Archives – Fontainebleau Site, Deposit 20070296, Staff files CNRS-30644).

[330] French participants: P. Auger, B. Ephrussi, F. Perrin, L. Rapkine and R. Wurmser; British participants: J.D. Bernal, P.M.S. Blackett, J.G. Crowther, C.F. Darlington, P.A.M. Dirac (on 16th), Waddington (on 23rd) and Zuckerman. (Fontainebleau, CAC, 80 0284 – 60, Folder *Anglo-French Society of Sciences.*) The first meeting of the French group of the Anglo-French Society of Sciences was held in Paris on 25 April 1940, in Patrick Petitjean, Stéphane Schmitt, Catherine Jami (eds.), *Science, histoire et politique : l'exemple de Cambridge,* Vuibert, 2009, p. 117-138.

[331] French Scientific Mission in the UK, Restructuring plans dated 20 August 1945, IP Archives, Fonds Rapkine.

[332] In 1944-1945, Francis Perrin was appointed as member of the Provisional Consultative Assembly of Algiers to represent the French Committee overseas (United States), and then as delegate at the National Education Commission. The French Committee of National Liberation (CFLN), which became the Provisional Government of the French Republic (GPRF) on 3 June 1944, was transferred to Paris; the Consultative Assembly also moved into the Senate Palace.

[333] Fontainebleau, CAC, Fonds CNRS, 800284-59, "Ambassade" Folder, Letter from Rapkine to the Ambassador, 6 August 1945.

[334] United Nations Educational, Scientific and Cultural Organization (UNESCO), a specialised agency of the United Nations based in Paris. On 16 November 1945, representatives of the 37 countries met in London to sign the UNESCO Constitution, which came into force on 4 November 1946, after being ratified by 20 signatory countries.

> fought a common battle. It is now important to mention some of them who were assigned by the Free France authorities to work with the British team on the atomic bomb, under the leadership of James Chadwick and Professor Cockcroft. Furthermore, it has already been established that in June 1940, Professor Joliot sent two of his colleagues, Dr Halban and Dr Kowarski, with instructions to place themselves and their experience at the service of the British. Dr Jules Guéron, Professor Pierre Auger and Dr Bertrand Goldschmidt later joined the British team in Montreal."[335]

Rapkine gave a vibrant tribute to team work, which he believed to be "increasingly penetrating the minds of French scientists".[336] He added that "this concept was clearly recognized in our fight against Nazism and Fascism, and thanks to this, Victory was achieved. (…) As a biochemist, I cannot help but feel troubled at the thought that if one tenth of the human energy, money and organisation used for building the atomic bomb were used in a concerted international effort to solve problems such as how to prevent or heal cancer or tuberculosis, we would probably succeed in solving them".[337] Rapkine continued by chastising the refusal of certain scientists to work in a group or team in the name of their scientific freedom, which he considered no more than selfishness or egocentricity. "They forget that they owe something in return to the nation's masses, who provide the resources for them to conduct their research".[338] Before concluding, Rapkine expressed the desire for an age when scientific cooperation between all nations "will not require gruelling diplomatic negotiations, but takes place spontaneously and freely".[339]

As they had always said they would, the vast majority of exiles in America returned to France. At no time had French scientists accepted the idea of taking American citizenship, which was a process that would have taken five years from submission of the first papers. They even renounced this when it could have facilitated access to American laboratories.[340] The only French scientists to remain definitively in the United States were André Weil and Emil Gumbel, who adopted American nationality in 1946, and Léon Brillouin in 1949. Henri Laugier was appointed Rector of the Academy of Algiers on 21 July 1943, before returning in November as director of the CNRS.[341] He was then responsible for the *Direction Générale des relations culturelles* (Directorate General of Cultural Relations) before his appointment in 1946 as

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[335] Louis Rapkine Show for the BBC *Science Magazine* on 16 September 1945 at 7:20 pm, IP Archives, Fonds Rapkine, p. 2, 5 typewritten pages, in English.

[336] *Ibid*, p. 3.

[337] *Ibid*, p. 4.

[338] *Ibid.*

[339] *Ibid.*

[340] This is why Bertrand Goldschmidt was unable to continue collaborating on research into the chemistry of plutonium with Glenn T. Seaborg in Chicago.

[341] For eight months exactly. He was restored to his post as director of the CNRS by the Order of 15 November 1943, French Committee of National Liberation, signed by René Capitant, National Education Commissioner, in Algiers. Joliot succeeded him on 20 August 1944, after being appointed by Henri Wallon. See Henri Laugier, "Le Centre national de la recherche scientifique", *Revue d'Alger,* no. 1, 1944, p. 6-20.

Assistant Secretary General for Social Affairs at the United Nations (UN).[342] Pierre Auger did not return to laboratory work and was appointed director of Higher Education.[343]

1.4.4. Return to New York, October-December 1945 – Louis Rapkine's mission to the Rockefeller Foundation in support of the CNRS

On 4 August 1945, Louis Rapkine wrote two letters from London, where he had been heading up the French Scientific Mission in the United Kingdom for around a year. The first was to the director of the Division of Natural Sciences at the Rockefeller Foundation, Warren Weaver, and the second to H.M. Miller, assistant director of the same division. Rapkine had just spent three weeks in Paris, where he had met D. P. O'Brien, assistant director of the Division of Medical Sciences, who had vaguely suggested that he take a short trip to the United States. O'Brien believed that Rapkine could provide valuable information regarding the status of French science to Foundation staff, before their own return to France after an absence of almost four years (1941-1945). Rapkine could see the end of the French Scientific Mission in the UK (which he had intended to wind down at the end of September, but it was only definitively dissolved in December 1945), but his position at the Pasteur Institute still seemed far away. Before realising his deepest wish of returning definitively to France for his laboratory work, he had the opportunity to help his American friends while supporting the reconstruction of French science. He therefore decided to take this trip, provided that his friends from the Rockefeller Foundation considered it to be appropriate.

Drawing on the strong personal ties Rapkine had forged in the USA during the war, he successfully negotiated two major grants from the Rockefeller Foundation for the CNRS, first for laboratory equipment and secondly for the organisation of international conferences,[344] with the aim of "boosting, rejuvenating and reorienting French science".[345] On 10 January 1946, Joliot affirmed "that the National Centre for Scientific Research will readily sign up for the proposals of the Rockefeller Foundation".[346] On 5 February 1946, Georges Teissier, previously deputy director, succeeded Frédéric Joliot as director of the CNRS when Joliot became director of the *Commissariat à l'énergie atomique* (CEA – French Atomic Energy

[342] On his five years in New York from 1946 to 1951, see Stéphane Hessel, "Henri Laugier aux Nations Unies : le pionnier de la politique de coopération sociale internationale", in *Henri en son siècle*, *op. cit*., p. 103-108.

[343] He held this position from 1945 to 1947, insisting on the creation of the first university chair for genetics, to which Boris Ephrussi was appointed (1946).

[344] Doris T. Zallen, "The Rockefeller Foundation and French Research", *Cahiers pour l'histoire du CNRS*, no. 5, 1989, p. 35-58.

[345] Inter-Office Correspondence, from WW to RBF, 19 November 1945, Tarrytown (NY), RAC, RG 1.2, S 500, Box 3, Folder 30, 5 p.

[346] Letter from Joliot to Miller, 10 January 1946, Tarrytown (NY), RAC, RG 1.2, S 500, Box 3, Folder 31.

Commission), founded on 18 October 1945[347] "by General de Gaulle's final order".[348] This civil body, the first of its kind in the world, ensured France's independence in atomic affairs. Fifteen days later on 28 February 1946, an official letter was sent to Weaver from the Ministry of National Education, National Centre for Scientific Research, signed by Frédéric Joliot-Curie, member of the CNRS board and former director, and Georges Teissier, current director of the CNRS. This was the official request on behalf of the CNRS and its board, to whom Rapkine had given a confidential presentation.

> "Please believe us when we say that we fully understand the exceptional nature of our request. [...] But the times are extraordinary; we have experienced extraordinary years under enemy occupation and dare to hope that you will be able to consider extraordinary measures to help us. We have faith and firmly believe that, with your help, we will have the opportunity to contribute once again to global scientific heritage, which knows, and must know, no borders."[349]

In early April 1946, the Rockefeller Foundation voted to approve two funds for the CNRS, valid until 30 June 1949.[350] The first was a sum of $250,000 to finance equipment in the 35 best natural science laboratories in France, and the second was a sum of $100,000, or more if needed, for foreign scientists to attend a series of short, informal conferences. On 10 May 1946, it was Minister of National Education Marcel-Edmond Naegelen's turn to thank the president of the Rockefeller Foundation.[351] Rapkine's mission to the Rockefeller Foundation was a total success. These grants were warmly welcomed by French scientists and they provided indisputable and comprehensive support for French scientific research to rebuild and quickly re-establish its international position.

1.4.5. Epilogue – In London and New York, ensuring the future of work carried out during the Second World War

After the Scientific Mission in the UK returned to France in late 1945, an office was opened in London by the *Direction générale des Relations culturelles* (Directorate General of Cultural

[347] In June 1954, under the presidency of Pierre Mendès France, Henri Longchambon, who, like Joliot, had chosen the Interior Resistance in France and was appointed Secretary of State for Scientific Research and Technical Progress with ministerial oversight for the French Atomic Energy Commission. See Diane Dosso, "Henri Longchambon (1896-1969), secrétaire d'État de Pierre Mendès France", in *Le gouvernement de la recherche. Histoire d'un engagement politique, de Pierre Mendès France à Charles de Gaulle (1953-1969), op. cit*. p. 62-74

[348] "It is therefore thanks to Louis Rapkine that I was able to participate in the war effort against the Nazis and, after victory, play an important role in the vast undertaking of the French Atomic Energy Commission, created in October 1945 by General de Gaulle's final order." See Francis Perrin, "La création à New York du Bureau Scientifique de la France Libre", p. 114-117 in Vivian and Benjamin Karp (eds.), *Louis Rapkine (1904-1948), op. cit.*

[349] Letter in French from Frédéric Joliot-Curie and Georges Teissier to Weaver, 28 February 1946, Tarrytown (NY), RAC, RG 1.2, S 500, Box 3, Folder 31, 4 p.

[350] For the conferences, this was extended until 30 June 1950 due to its success.

[351] "Speaking for myself and on behalf of the French Government, I would like to tell you how touched we are by the generosity of this gesture and would like to express our deepest gratitude. I am especially happy to see even closer ties of friendship between our two countries with regard to scientific collaboration." Letter "in French from E. Naegelen, Minister of National Education, 10 May 1946, Tarrytown (NY), RAC, RG 1.2, S 500, Box 3, Folder 31.

Relations), under the authority of the cultural advisor to the Embassy. In 1947, the CNRS decided to create a secretary office, followed shortly by the Atomic Energy Commission, which also appointed a secretary.[352] The office had three main tasks: visits, documentation and equipment orders.

In 1947, the CNRS Scientific Office was opened in New York, jointly by the CNRS and the Atomic Energy Commission. Its general secretary, Gerda Friedmann, served as the CNRS and CEA procurement office, with the support of two employees. Her role was crucial for French scientific research. During the reconstruction years, many laboratory machines and chemicals were not yet available in France. Sometimes, these products were even rare in the USA. This French presence in the United States also ensured that the CNRS could use the gift from the Rockefeller Foundation. Gerda Friedmann soon represented the French government for the purchase of radioactive isotopes. The first orders came from the Ministry of Public Health in May 1948. When Gerda Friedmann left New York in 1949 for a position at UNESCO in Paris, Janine Bernheim[353] replaced her as manager of the CNRS office. The CNRS New York office was only officially established in 1953 by an order of 27 July.[354]

Unlike a number of Rapkine's scientific colleagues and friends who had been exiled during the war and joined the new bodies created after the Liberation, he chose to return to laboratory work as quickly as possible, after a seven-year break, with plans to create a school of biochemistry.[355] He did not return to the Institute of Physico-Chemical Biology but joined the Pasteur Institute in late January 1946 to lead a cellular chemistry department. Opening a laboratory during the reconstruction period was a real challenge. Chemicals, glassware and machines were missing from laboratories, along with manufacturer catalogues, as French industry had been bled dry. Foreign scientific journals were desperately lacking or irregular in France. Nevertheless, Rapkine succeeded in time by investing extensive energy and thanks to his contacts overseas, the support of the Rockefeller Foundation and the Pasteur Institute.[356] He resumed his research in April 1947 with two colleagues and the plan to soon welcome two

[352] Fontainebleau, Fonds CNRS – *Relations extérieures et information* (External relations and information) 780309 – 50, "*Représentation à Londres du CNRS*", A. M. Vidal-Hall, 1952.

[353] Jeanine Bernheim, born Wertheimer. She also worked for the treasury of the French Scholars' Fund. On 17 September 1951, in tribute to Louis Rapkine, who died in 1948, the French Scholars' Fund became the Rapkine French Scientists Fund. This fund aimed to facilitate the purchase of equipment for French laboratories from the USA (i.e. directly in dollars thanks to donations from American institutions or individuals). It played an important role in speeding up the reconstruction of French scientific research during the immediate post-war shortages. Until 1976, it was managed by the CNRS New York office. In 1985, it became the *Pasteur Foundation* to emphasise its long-standing partnership with the Pasteur Institute.

[354] After its procurement department was restructured in 1973, the CEA was no longer represented in New York, but instead in Washington, by an atomic energy attaché at the French Embassy. The CNRS New York office was finally closed on 30 June 1982 and transferred to Washington (Gif-sur-Yvette, CNRS Archives, Mission des Relations Internationales (International Relations Mission) 930061, "*Le bureau du CNRS à New York, Historique*", March 1981).

[355] "(With great pleasure) I have now given up all the organisational and administrative responsibilities I have had in the recent war years and can concentrate my energy on research and the creation of a small school of biochemistry", Correspondence during and after the war, Letter from Rapkine to Lyla and Lou Rasminsky, copy, 22 October 1946, IP Archives, Fonds Rapkine, Correspondence during and after the war, Letter from Rapkine to Lyla and Lou Rasminsky, copy, 22 October 1946.

[356] While negotiating funds for the CNRS with the Rockefeller Foundation, he refused a loan to set up his own laboratory, not wanting to benefit from his privileged situation. His only benefit was priority in purchases.

other students and a technical assistant.[357] He looked forward to training young scientists in order to share his convictions regarding scientific research. One month earlier, he had been named a Knight (*Chevalier*) of the Legion of Honour on behalf of National Education. General Paul Dassault, Grand Chancellor of the Legion of Honour, specified that it was at his request, adding: "I would have preferred to bestow this decoration upon you on behalf of the military. That would have taken much longer and, in any case, coming from my personal initiative, this cross has, without doubt, a National Defence dimension".[358]

On 13 December 1948, Louis Rapkine died at Beaujon hospital from lung cancer, after detecting the first symptoms in June. He was 44 years old. His funeral took place at Montrouge cemetery on 15 December at the same time as the first French heavy water nuclear reactor, Zoé (Zéro puissance, Oxyde d'uranium, Eau lourde – zero power, uranium oxide, heavy water), was launched at Fort de Châtillon,[359] with the President of the Republic, Vincent Auriol in attendance.[360] With a power of a few kilowatts, Zoé provided artificial radioelements for hospitals and research laboratories, representing a civil use of atomic power.[361] From Resistance to deterrence, France had therefore returned to its place as a leading scientific power in the aftermath of the Second World War. It had also become a nuclear power, which was a fundamental component in its strategy for national independence.

[357] One of the students was Canadian Lou Siminovitch. See "My friend, François Jacob, an icon among icons" in *Research in Microbiology*, 2014, vol. 165, p. 316-317.

[358] Handwritten letter from General Dassault to "My dearest Rapkin", 15 March 1947, IP Archives, Fonds Rapkine, Darius Paul Dassault was the older brother of industrialist Marcel Dassault. Dassault, born Bloch, was his code name in the Resistance.

[359] "For me and my nuclear colleagues and friends it was especially ill-timed: he was buried on the very day we started the first French nuclear reactor." See Jules Guéron, "The Free French Scientific Mission in the United Kingdom", p. 50-52 in Karp (eds.), *op. cit.*

[360] One of the 80 members of parliament who refused to vote for the full investment of power to Marshal Pétain on 10 July 1940 in Vichy. See Diane Dosso, "La mobilisation scientifique de la France Libre : la part des socialistes", Special issue of *L'OURS Recherche socialiste* no. 78-79, *Les socialistes et les sciences XIX^e^-XXI^e^ siècle*, June 2017, p. 55-74.

[361] "The knowledge that we had been able to contribute supported the quick launch of the French Atomic Energy Commission and Rapkine's action during the war is partially to thank." See Goldschmidt, "A L'entreprise Atomique Alliée", *art. cit.* Also see Robert Belot, *L'atome et la France. Aux origines de la technoscience française,* Odile Jacob, 2015. Particularly Chapter 7 "Le CEA, pour la 'grandeur de notre pays' et le 'progrès de l'humanité'", p. 137-160 and Chapter 10 "Et Joliot créa ZOÉ", p. 195-214.

1.5. The origins of Franco-British nuclear cooperation: A British view

*John Baylis**

There has been considerable interest in the United Kingdom in recent years in the future of British-French nuclear cooperation following the Lancaster House Treaty in 2010 and an agreement to extend the treaty following the British-French summit meeting in 2014. Under these agreements there will be an *Expériences de physique utilisant la radiographie éclair* (Joint construction and operation of an X-ray facility – EPURE) at Valduc in France and a Joint Technology Development Centre at AWE (Atomic Weapons Establishment) Aldermaston. At the 2014 meeting, an even wider range of information sharing was agreed, including technical and scientific information relating to warhead testing, as part of a new long-term nuclear relationship between the two countries.[362] For many observers of the British nuclear programme, the traditional focus has been on the special nuclear relationship with the United States, and there is very little understanding in the United Kingdom that the origins of British-French nuclear cooperation stem from important scientific collaboration during World War Two which laid the foundations for both the British and French atomic energy programmes in the years after 1945. The main focus of this chapter is to explore this largely neglected wartime cooperation and to assess its significance.[363]

1.5.1. The Peierls-Frisch Memorandum and the Allier Mission

French and British scientists made a substantial contribution to the history of atomic energy research in the 19th and 20th centuries. These scientists included John Dalton, Henri Becquerel, Paul Villard, Michael Faraday, Ernest Rutherford, Marie and Pierre Curie, Jean Frederic Joliot-Curie, J.J. Thompson, and John Cockcroft. Scientists from both countries were also strongly involved in the major research that took place in the 1930s. Irene and Jean Frederic Joliot-Curie did important work on the structure of the atom, particularly on the projection of nuclei that had been struck by other particles. This was an essential step in the discovery of the neutron by James Chadwick in 1932. These discoveries were critical to the scientific events which took place from 1938 to 1940. In December 1938, the German chemist Otto Hahn stumbled on the discovery of nuclear fission. And in September 1939, two days before war broke out, the Danish physicist Neils Bohr and an American colleague, J.A. Wheeler, published a paper outlining the theory of uranium fission. Their paper highlighted the importance of the fissile isotope uranium-235, which would have to be separated from uranium-238.[364] They did

* University Professor Emeritus

[362] See *AWE: Britain's Nuclear Weapons Factory: Past, Present and Possibilities for the Future: A Report by the Nuclear Information Service 2016,* p. 23.

[363] The main exception to this is the work of Margaret Gowing. She writes at length about the wartime relationship with France in her *Britain and Atomic Energy 1939-1945* (London: Macmillan, 1964).

[364] Otto Hahn worked closely with Fritz Strassmann and Lise Meitner. He received the Nobel Prize in 1944 for his work. Natural uranium contains 99.3% U-238 and 0.7% U-235. See Margaret Gowing, *Britain and Atomic Energy 1939-1945* for an excellent

not believe, however, that such separation would be possible. At this time French scientists were also undertaking important research into atomic energy, especially in the area of fast and slow neurons. The Paris group of scientists, under Professor Joliot-Curie, were looking into the possibility of creating a chain reaction by slow neutrons in a system containing natural uranium, using water as a moderator. Following the outbreak of war, a report of their experiments was published indicating that they had been able to produce a convergent chain reaction – albeit one that was not self-sustaining. Scientists in the Paris group had also worked out a way of controlling the reaction by introducing neutron-absorbing material to limit the multiplication of neutrons, thereby producing a nuclear furnace or boiler.

These discoveries were published in the journal *Nature* in 1939. Professor G.P. Thompson, one of the leading nuclear physicists in Britain at the time, immediately recognised the significance of these discoveries, particularly the idea that a mass of uranium could be a source of both heat and power, and possibly the source of an explosive device of enormous potential. As a result, he recognised the importance of securing Belgium sources of uranium as quickly as possible. In the early months of the war, the prevailing view in Britain, however, including that of Prime Minister Winston Churchill, was that it was improbable that a practical form of a bomb could be produced in the foreseeable future.

In March 1940, two physicists in Birmingham, Rudolph Peierls and Otto Frisch, wrote a memorandum not only showing that a lump of uranium-235 of just 5kg would produce an immensely large reaction needed for an atomic explosion, but also suggesting an industrial method of separating uranium-235.[365] Shortly after the memorandum was produced, Lt Allier of the French Ministry of Armaments (and a wartime member of the French Secret Service) paid a visit to London where he met Professor Thompson, and other leading physicists Professor Oliphant and Professor Cockcroft. Lt Allier informed the British scientists of the work being done in Paris and the French achievement in removing the whole stock of heavy water from Norway.[366] French research had focused on the possibilities of mixing heavy water and uranium. Heavy water, with its hydrogen atoms, was an exceptionally efficient moderator for slowing down neutrons, creating the possibility of achieving a chain reaction. He also told them that the Germans had tried to acquire the heavy water themselves and were anxious to find out what progress had been made by the French nuclear scientists. As Margaret Gowing has argued, this visit by Lt Allier, together with the Peierls-Frisch Memorandum, had a strong impact on the British government. "Interest about the uranium bomb which had been waning, now waxed rapidly."[367] The Allier visit and the memorandum led to a meeting of a group of

history of the earliest ideas about the atom, and the discoveries of a wide range of great scientists from the early 19th century to 1940. Other key scientists were Fermi, Heisenberg, E. O. Lawrence and Lise Meitner.

[365] See Lorna Arnold and Mark Smith, *Britain, Australia and the Bomb: The Nuclear Tests and their Aftermath* (London: Palgrave, 2006), p. 1-2.

[366] In peacetime, Lieutenant Allier was an important personality in the Banque de Paris et des Pays-Bas which owned a majority share in the Norwegian Hydro-Electric Company. He went to Oslo in February 1940 where he persuaded the company to hand over to him their entire stock of heavy water before the Germans were able to secure the stock for themselves. He was able to take the heavy water back to France with him.

[367] Margaret Gowing, *Britain and Atomic Energy 1939-1945,* p. 43

distinguished scientists, including Professors Thompson, Oliphant and Cockcroft, who alerted the wartime Churchill government that it would be possible to develop weapons of immense power, probably during the timescale of the war.

In June 1940, as France was on the verge of defeat, two highly respected French scientists, Dr Halban and Dr Kowarski, from Professor Joliot's Paris Group of physicists, arrived in Britain from Bordeaux with 26 cans (185kg) containing the world's stock of heavy water secured in February 1940 from the Norwegian Hydro-Electric Company. The French physicists were put to work alongside Dr Bretscher and Dr Feather in the Cavendish Laboratory at Cambridge University. There was, however, some scepticism at the time about their work on slow neutrons having any immediate effect on the war effort. In the summer of 1940, the UK government had set up a special committee (code-named the Maud Committee) to look into the claims made in the Peierls-Frisch Memorandum and the prospects of using uranium 235 and fast neutrons to develop a bomb. In their report to the Maud Committee, Halban and Kowarski indicated that, while their research envisaged an 'engine' or 'boiler' that could produce immense power for peacetime purposes, it might be possible to produce fission by slow neutron absorption that could be of military value. This was an intimation of the possibilities of plutonium that was to prove so crucial to later research. At the time, however, these ideas were highly speculative.

In the autumn of 1940, the Tizard Mission was sent to the United States by the Churchill government. The US was not at war but the British government was concerned to develop as close as possible a relationship with the Roosevelt administration in the hope that the US would soon commit itself to the British cause. The Tizard Mission revealed to the US the latest developments in UK scientific research on atomic energy, as well as a wide range of other vital military secrets. At this stage, while important research had been undertaken in the US on atomic energy, work was several months behind that being undertaken in Britain. The Mission, however, had the effect of speeding up US research. During the visit to the United States, Professor Cockcroft, a member of the Tizard Mission, visited Dr G.C. Lawrence of the Canadian National Research Council, who had been conducting research similar to that of Dr Halban and Dr Kowarski on the possibility of a chain reaction with thermal neutrons. This was to be the first very important step in a British-Canadian atomic energy relationship, which came to fruition later in the war.

1.5.2. The Maud Reports and the future of the French scientists

In the deliberations that took place in the Maud Committee during late 1940 and early 1941, the question of the future of the French scientists was discussed. Dr Fermi at Columbia was conducting research similar to that of Halban and Kowarski, except that he was using carbon in the form of graphite rather than heavy water as a moderator. Initially, the Maud Committee felt that they should be transferred to the US to continue their research, especially as it seemed likely that it would be at least two years before their research was likely to bring results. Dr Halban also expressed the view, to begin with, that he would like to go. He and Dr

Kowarski felt that they had been sidelined somewhat and the lack of resources was hampering their research.

In June and July 1941, two Maud Reports were produced for the government to consider. One dealt with the prospects for the uranium bomb. It was argued that this was practical and could be produced by the end of 1943. In those dark days of the Second World War when Britain's very existence seemed to be at stake, the scientists warned that Germany might be developing these weapons and recommended that Britain should undertake its own atomic weapons programme.[368] The second report considered the use of uranium as a source of power. It was argued that a "boiler" could produce nuclear energy that had great possibilities for peacetime development but such an approach "was not worth serious consideration from the point of view of the present war".[369] In Margaret Gowing's view, the Maud committee was "one of the most effective scientific committees that had ever existed".[370] Its work led to the setting-up of the UK Tube Alloys project, designed to produce an atomic weapon for use in the war, if necessary, and to enhance Britain's power in the post-war world. In one important aspect, however, the scientific judgement of the committee was in error. It failed to recognise the importance of plutonium and the work of the French scientists for war purposes. This work proved to be of central importance to the US atomic energy programme. The recommendations of the Maud Committee were sent to the United States in the summer of 1941 and played an importance part in the acceleration of the US programme. The emphasis there, however, centred on the work being undertaken by Professor Lawrence at Berkeley and the work of Dr Fermi at Chicago under the direction of Professor Arthur Holly Compton (who was chair of the National Academy of Science Committee).

In mid-1942, Britain pushed for the Halban team to be sent to the US and to work with Fermi's group at Chicago. Dr Bush, the head of the US National Defense Research Committee (NDRC), pointed out that there would be considerable political difficulties in accepting the request. The FBI was opposed to foreign nationals participating in secret defence projects. Increasingly, also, the US was moving ahead of the UK in its scientific research and was reluctant to consider the kind of complete integration of projects now favoured by the British. Britain pressed for greater collaboration throughout late 1942 and early 1943, with little success.[371] As a result, consideration had to be given to "going it alone", or some form of collaboration with Canada, following on from Professor Cockcroft's visit in 1940 and discussions in the autumn of 1941. Recognising the benefits of close ties with the US, however, Churchill continued to press

[368] The MAUD Committee was named after a statement in a telegram sent by Niels Bohr to Otto Frisch after the Germans overran Denmark. The statement read: "Tell Cockcroft and Maud Ray Kent." This was wrongly interpreted as a message about radium or possibly "uranium disintegration". In fact, as was discovered later, it referred to a lady called Maud Ray in Kent who had worked as a governess to the Bohr children. Bohr did in fact want a message sent to her. As Margaret Gowing has shown, the name Maud was adopted for "what was to be a scientific committee of incalculable importance". Margaret Gowing , *Britain and Atomic Energy 1939-1945,* p. 45.

[369] *Ibid*., p. 80

[370] *Ibid.*

[371] Professor Compton and his team at Chicago were in favour of the French scientists joining them but General Groves was opposed.

Roosevelt for greater atomic collaboration. In August 1943, he finally got his way. Following the Quebec Agreement at the Quadrant Conference between Churchill and Roosevelt, the American president told Bush "to review in an inclusive manner the full exchange of information with the British".[372]

1.5.3. The British-Canadian-French Project

Given continuing US sensitivities about foreign nationals in the secret atomic energy programme, Britain decided in January 1943 to go ahead with greater collaboration with Canada in the slow neutron field of research. Agreement was reached with Professor G.C. Lawrence to develop the Montreal Laboratory to include a number of Free French chemists and physicists (Dr Guéron, Dr Goldschmidt and Professor Auger) under the leadership of Dr Halban. There were, however, difficulties with this approach. Personality clashes and difference of scientific method had arisen between Halban and Kowarski. Dr Kowarski was not happy about accepting a junior position at the Montreal Laboratory and refused to accept the position, preferring instead to remain with the Cavendish group at Cambridge. The Montreal group was eventually set up in April 1943 but, due to uncertainty over the future of collaboration with US scientists, key decisions on the construction of a heavy water pile in Canada could not be made until after the Quebec Agreement had been signed in August. Even after the agreement was reached, however, difficulties remained for a time. General Groves, the head of the US Manhattan Project, decided to build a US heavy water pile at Argonne, and there was little interest in supporting the Montreal Laboratory scientists. The US continued to mistrust the mixture of nationalities, and the relationship between Roosevelt and de Gaulle and his Free French forces was not good.

The situation was only improved with a change of management at the Montreal Laboratory. The US pressed for a new director of the whole project and argued for a British scientist of distinction. The obvious choice was the eminent physicist Professor J.D. Cockcroft who had worked at the Cavendish Laboratory under Professor Rutherford in the 1930s and had been a member of the Maud Committee. Cockcroft was wanted at the Cavendish Lab and his work on radar was a high priority in the war effort. Also, Cavendish himself was not willing to go to Canada unless the US was prepared to supply the materials and support that was necessary to make a success of the work being undertaken in Montreal. It was not until April 1944 that it was finally agreed that Cockcroft should take over the management of the project. With his appointment, Dr Kowarski and the rest of the Cavendish team joined the Montreal Lab and morale, which had been very low, began to improve. There was still some disappointment that the US was unwilling to exchange information on the chemistry of plutonium, especially on the methods of separating plutonium and purifying it. A compromise was reached, however, with the US supplying a limited amount of irradiated uranium rods, and the scientists in Montreal were able to work out the extraction and chemical properties of plutonium for themselves.

[372] Gowing, *Britain and Atomic Energy 1939-1945*, p. 169.

By mid-July 1944, a site was chosen for a pilot pile on the Ottawa River 130 miles from Ottawa near a small village called Chalk River. After discussions with the Chicago scientists, an NRX design was chosen for the pile. A case was also made for building a small experimental zero-energy pile that produced a divergent chain reaction but little heat or energy. This led Dr Kowarski to put forward the idea in July of a zero-energy reactor at Chalk River, called ZEEP. A graphite group was also set up in Montreal. ZEEP, the first reactor outside the US, eventually started in September 1945, after the war ended, and the NRX pile did not go critical until July 1947. Both projects, however, were highly successful and became the basis of Britain's post-war nuclear energy programme.

The Free French scientists at Montreal made a substantial contribution to the success of the project. This was particularly true of Kowarski and his work on nuclear piles, together with Guéron and Goldschmidt who did important work in the Chemistry Division, especially in the separation of plutonium. Problems arose, however, over the role of Dr Halban in the latter stages of the war. He created animosities amongst the staff in Montreal and in the United States, and "he was compelled to leave the project in unhappy circumstances".[373] These problems arose over his wish to visit France in October 1944 and over various patent agreements that posed dilemmas for Britain in its relationship with the United States.

1.5.4. The patents issue

Before the war Halban and Kowarski, working with other members of the Paris group, had been involved in various patents and financial agreements relating to their scientific discoveries. Five patents had been filed in France and, following their arrival in Britain, applications were made for eight more patents, some with British researchers at Cambridge. With the British financing their work in the UK, the government wanted to safeguard its own interests and in early 1942 arrangements were made to sort out the tangle of French patents. An agreement was reached with Halban and Kowarski whereby they were to be given the French and French Colonial Empire rights in any patents that might be granted on the inventions they had made to date, and also any other patents where they were the main researchers. In the negotiations leading to the 1942 patent agreement, the British tried to balance their financial contribution to the research with their recognition that the slow neutron project depended almost entirely upon the work done by the French scientists. The key British minister, Sir John Anderson, in particular, recognised that Britain had a moral obligation to France for the work that was being done by the French scientists.[374] This sense of loyalty to Halban and Kowarski, however, was to cause difficulties with the United States. As far as Halban and Kowarski were concerned, there were also conflicting obligations. They were conscious of their debt to Britain but they had also been charged by Professor Joliot before going to Britain to look after French interests.

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[373] *Ibid.,* p. 289.

[374] Sir John Anderson had been Home Secretary and president of the Privy Council. He was later to become Chancellor of the Exchequer and in the post-war Attlee government he was the key adviser to the prime minister on atomic energy.

The main problems with the US began after the Quebec Agreement was signed in 1943. Under Article 3, the US and Britain agreed not to communicate information about the Tube Alloys project to third parties without the other's consent. In agreeing to this, Britain forgot about the reciprocal rights they had entered into with the French scientists in 1942. Dr Bush was informed in September 1942 of the agreements with the French by Sir John Anderson (the government minister responsible for the Tube Alloys project). It was, however, only a passing reference, and it is not surprising that Washington was not aware of the significance of the British obligations to France. The matter came to a head in October 1944 when Dr Guéron visited France, and then Dr Halban also requested that he be allowed to visit Professor Joliot in Paris. The Americans were greatly angered by these visits, partly because they had not been cleared with the Combined Policy Committee responsible for dealing with matters of British-American policy and partly because they did not trust Professor Joliot, who was known to have communist sympathies. They had no obligations to France and saw grave dangers in Halban passing on highly secret information to the Free French under de Gaulle. The result was a significant crisis in British-American relations that for a time threatened to undermine the whole nuclear partnership being developed in the Manhattan Project. Fortunately, adroit diplomacy by British representatives in London and Washington helped to avert a breakdown in the relationship. Dr Halban's decision not to return to the Montreal Laboratory also helped to diffuse the tensions. The whole patents issue, however, was to remain an important question into the post-war period.

1.5.5. Discussions about Anglo-French nuclear relations in the post-war period

As a result of the 1942 patents agreement, Sir John Anderson believed that it was highly likely that in the post-war period France would demand some form of partnership with Britain in atomic energy. His support for Halban's visit to Professor Joliot-Curie in 1944 was based on the view that such demands would be less exacting if the French scientists in Montreal were treated with trust. He hoped that Halban would be able to convince Joliot to accept the 1942 agreement. Shortly after the liberation of France, Professor Joliot came to London and, in discussions with Professor Chadwick, efforts were made to persuade Joliot that French interests were best served by not raising the question of the agreements at this stage. Recognising their dilemma over the moral and paper obligations to France and their obligations under the Quebec agreement with the United States, the British government was concerned to "play for time".

Anderson's position was not to admit the French to full collaboration or to provide them with information about the whole Tube Alloys programme. He recognised that the Quebec agreement would not allow such arrangements. However, he hoped that it might be possible to convince the American government that France should be given a share in what benefits might arise from the slow neutron research, in line with the contribution their scientists had made. There was also a recognition in Britain that Joliot had communist sympathies and, if France was not given some access to British-American atomic energy programmes, this might push France into the arms of Russia. Joliot had indicated to Anderson in a visit in early 1945

that, if France was not to be admitted to collaboration with Britain and the United States, she would have to turn to Russia. He said that inquiries had already been made of Russia and they had indicated that they would be interested. There was also the worry that France might pursue competing patent applications all over the world if no satisfactory arrangement was reached.

In the light of this, Anderson put forward two options in 1945. The first was to offer France a new, more attractive agreement on patent rights. Joliot had made it clear to Halban that he was not happy with the 1942 agreement. He believed that a new agreement would have to include some rights to American patents. Getting the Americans to agree to this, however, might be very difficult. The second option was to offer France "a firm understanding of fair treatment over Tube Alloys" in the post-war period, which would involve a formal document signed by both the UK and US governments.

These options were discussed with the Americans but were rejected by them. They had no obligations to France and were not prepared to disclose American patents. If Britain wanted to give some vague assurance to France that did not infringe the Quebec agreement, that was up to them. Neither were the Americans swayed by British concerns about France looking towards the Soviet Union in the post-war period.

Anderson subsequently tried to persuade the prime minister that some assurance should be given to France that it would be admitted to some form of participation in the British-American atomic energy programme as soon as security considerations permitted, and hopefully before the end of the war. Churchill, however, would not agree to this. At one stage, when it was suggested that there was a danger that Joliot might advise de Gaulle to "take action in another direction" if there was no agreement on a post-war partnership of some form, he said that if this was so, Joliot "should be forcibly but comfortably detained for some months".[375] The prime minister was firmly of the view that the Quebec Agreement was paramount and it did not allow information to be disclosed to any third party. His views were summed up in a minute he wrote in early 1945:

> "You may be quite sure that whoever gets hold of the secret will try to make the article and this touches the existence of human society. This matter is out of all relation to anything else that exists in the world, and I could not think of any disclosure to third or fourth parties at the present time. I do not believe there is anyone in the world who can possibly have reached the position now occupied by us and the United States."[376]

As a result, when the war ended there were unsettled mutual ties and obligations between Britain and France, which were to have implications for the French nuclear programme in the post-war period.

[375] Gowing, *Britain and Atomic Energy 1939-1945*, p. 344.

[376] *Ibid*., p. 360.

1.5.6. The legacy of the war-time period

In spring 1946, two members of the newly formed *Commissariat à l'Énergie Atomique* (CEA), Kowarski and Goldschmidt, visited London to discuss the wartime atomic energy patents. Professor Joliot Curie, now High Commissioner of the CEA, indicated that France was not prepared to accept the kind of arrangements envisaged in the 1942 agreement. The French position was that all the inventions made in France and Britain were connected and that there should be joint British and French arrangements to exploit the inventions around the world. Joliot also envisaged a pooling of patents that would include the United States as well. By this stage France had already begun pursing patent applications on the five inventions made before the war on French soil and also on two patents that were part of the 1942 agreement. The French aim was to try to achieve an agreement that covered the whole field of atomic energy.

These proposals were discussed by the Official Atomic Energy Committee in Britain in December 1946. By this stage, although there was still some lingering feeling of obligation to France, it was felt that, because of the experience gained by the French scientists in the Allied project, France owed much more to Britain than Britain owed to France. The problem for Britain at this time was that the United States, contrary to the Quebec Agreement of 1943 and the Hyde Park Agreement of 1944, had passed the McMahon Act, ending the wartime nuclear partnership between the two countries. In trying to weigh up the balance of advantage of collaborating with France or the US, the committee had to decide whether it might be possible to restore links with the US. Professor Chadwick expressed the view that "the advantage for cooperation with France was imponderable rather than tangible, more political than scientific". Similar views were expressed by the Foreign Office. In their view, "while the French were quite important in atomic energy, the Americans came first".[377] In the light of this, the committee concluded that the French proposals for cooperation should not at present be accepted, but they did not wish to reject them completely. In their reply, they indicated that Britain was, in principle, interested in cooperation but the time was not yet right to pursue an agreement. Joliot accepted this decision but expressed the view that he hoped atomic energy collaboration would be possible later.

In September 1947, just at the time that the Attlee government in Britain was making its decision to pursue an independent nuclear deterrent force, France asked the UK for assistance in two specific areas. The first was for electronic equipment for pile control. Because this was declassified, this was agreed. The second request, however, was more difficult. France wanted Harwell, Britain's post-war experimental nuclear establishment, to test the nuclear properties of a sample of graphite produced in France. Because Britain depended on graphite tests undertaken in the United States, it was felt that this information could not be passed on. A further request in late 1947 was possible, though. France asked for the return of some of the heavy water it had provided in 1940. The government agreed to have it brought back from

[377] Margaret Gowing, *Independence and Deterrence: Britain and Atomic Energy 1945-1952*, Volume 1 (London: Macmillan, 1974), p. 156.

Canada and returned to France. There were also visits by French scientists to Harwell and British scientists to France in the late 1940s. Although no classified information was exchanged, UK scientists were able to advise on the right pattern for France to follow.

Despite the close ties between UK and French scientists and this assistance, Britain remained committed to the objective of trying to repeal the McMahon Act and re-establish the close nuclear relationship with the United States that had prevailed during the war. In 1948, a Modus Vivendi was agreed between London and Washington, opening up some limited cooperation. In 1950, Britain conducted its first atomic test, and in 1954 there was a further agreement between the two countries. In 1957, Britain conducted its first thermonuclear test, which led in 1958 to the repeal of the McMahon Act and the start of a very close nuclear partnership, which Britain had sought patiently since 1946.

Britain's decision to seek close nuclear ties with the US rather than France had important repercussions in Paris. French military leaders in the mid-1950s pointed to Britain to justify their claim that atomic weapons were not something that only the superpowers possessed. The kinds of strategic justification provided by the British for their independent deterrent were subsequently used by those advocating a French nuclear programme, especially in the *Revue de Défense Nationale*.[378] De Gaulle came to power just as the McMahon Act was being repealed, indicating that a French nuclear force was necessary if France was to achieve equal treatment. As Andrew Pierre has argued:

> "The British and French nuclear programmes over a period of a decade strongly interacted with each other; the British nuclear force, and the privileged nuclear relationship with the United States, were a thorn in the side of France which strongly stimulated the French nuclear decision."[379]

Despite this "interaction", Britain and France pursued their own nuclear paths, largely independently. For Britain, that independence depended very much on its increasing dependence on the US relationship. There were some attempts to re-establish closer nuclear ties with France in the 1970s during the Heath administration, but the restraints which had limited the relationship during and after the Second World War proved too strong. The 2010 and 2014 agreements therefore represent a new beginning. It is, however, a new beginning based upon an important legacy from the cooperation that took place between Britain and France during the Second World War. It remains to be seen whether Professor Joliot-Curie's vision in 1945 of a broader partnership between Britain, France and the United States can come to fruition in the years ahead.

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[378] W. Mendl, *Deterrence and Persuasion: French Nuclear Armament in the Context of National Policy 1945-1969* (London: Faber and Faber, 1970.

[379] A. Pierre, *Nuclear Politics: The British Experience with an Independent Strategic Force 1939-1970* (Oxford: Oxford University Press), p. 313-314. See also Margaret Megret, "L'Angleterre et le '"Deterrent National'', *Revue de Défense Nationale*, March 1961, p. 423-436.

1.6. Heavy water and the Antwerp diamonds – crossed destinies

Bruno Comer[*]

The first volume ("The Call to Honour") of General de Gaulle's war memoirs, and particularly Chapter Two ("The Fall"), mentions the evacuation of "heavy water" from Paris to England. This transportation on board the cargo ship *SS Broompark* is widely attested in administrative documents. The memoirs of Paul Timbal, one of the passengers on board the *SS Broompark*, were published in Belgium by the Royal Historical Commission in 2014, and contain a testimony filled with practical and more personal details.

Paul Timbal was a French-speaking resident of Brussels and managing director of the Antwerp Diamond Bank. One of the bank's shareholders, *Banque Transatlantique*, had its safety deposit centre in Cognac, Charente Maritime, in western France. In this little town far from industrial zones, the bank had vaults that could withstand bombing, which is why the town was suggested as the meeting place for Antwerp diamond merchants if they had to leave the country, even before the German attack of 10 May 1940.

1.6.1. *Journey to the* SS Broompark

In just the first days of hostilities, the Albert Canal front in the east of Belgium was breached and the Belgian Army had to retreat to its main line from the French-Belgian border in the Ardennes (near Sedan) to Antwerp. This port city therefore risked finding itself in the middle of fighting. On 13 May, Timbal fled as a precautionary measure, first to Paris and then to Cognac. He held a safe-conduct pass from the French Embassy in Belgium, stating that all civil and military authorities should facilitate his mission. The boot of his car held two crates filled with diamonds. At the time, it was customary for diamond merchants to give their merchandise as a deposit or guarantee in sealed bags, without mentioning their value to bankers. The whole system was based on trust. So even Timbal was unaware of the true value he carried, but he estimated it to be at least 100 million Belgian francs (roughly equivalent to €67 million today). He travelled with André Van Campenhout, a legal advisor to Prime Minister Pierlot and representative of the state. The Belgian government and Timbal had come to the conclusion that goods of this nature needed to be accompanied by a representative of this level.

On the first day of their journey, Timbal and Van Campenhout got no further than Compiègne, because they lost a lot of time at the French-Belgian border. A police commissioner authorised them to place the two diamond crates in a cell at the police station. Two officers stood guard all night, playing cards, without knowing that the crates contained diamonds.

[*] Independent researcher.

In the end, their journey to Paris was successful and the diamonds were placed in the vaults of the *Banque Transatlantique*. A few days later, the bank managers decided to transport the diamonds to Cognac for security reasons.

On 4 June, Timbal was in Royan to organise the diamond trade. He was convinced that the French Army would hold the front, which currently spanned from the mouth of the Somme, across northern France, to the northern part of the Maginot line. On that day, the British Consulate in Bordeaux invited him to go to London for discussions with Ernst Oppenheimer, CEO of mining company De Beers and one of the shareholders of the Antwerp Diamond Bank, and with a representative of the Ministry of Economic Warfare.

They agreed that Paul Timbal would continue his efforts to establish the Antwerp diamond trade in Charentes for the duration of the war, but that the diamonds would be transported to England, if necessary. When he returned to France on 13 June, it soon became clear that the German advance could not be stopped. Timbal therefore took the diamonds to Bordeaux, where, on 18 June, he boarded the *SS Broompark* thanks to the work of the British Consulate.

1.6.2. Only a cargo ship

It was on this ship that he met Halban and Kowarski, the two nuclear scientists transporting the heavy water from the Marie Curie Institute. According to Halban, this heavy water was of a similar value to the diamonds, and their main concern was that these goods did not fall into enemy hands.

Timbal, Halban and Kowarski were the key contacts for Lord Suffolk and Major Golding, the two expedition commanders. There were around one hundred passengers, including Polish and French officers and munitions factory managers, some accompanied by their family. One of the passengers was Hubert Ansiaux, Inspector of the Belgian National Bank, returning from an unsuccessful mission to France where he had failed to prevent some of the Belgian gold reserves from falling into the hands of the future Vichy Regime. The Belgian state was only fully reimbursed in 1997.

The *SS Broompark* could cruise at up to thirteen knots, which was fast for a cargo ship. Timbal tells how the boat shook from the pressure of the engines. The journey to Falmouth in Cornwall was quite long (3 days), because the *SS Broompark* had to follow a circuitous route for security reasons. The journey would have taken even longer if it had travelled in convoy.

The fact that only a cargo ship was available for a load of this importance reveals something about the situation of the British Army. The British were just recovering from the Battle of Dunkirk, and were evacuating any remaining Royal Air Force (RAF) personnel. Churchill had forbidden the engagement of British aircraft in the Battle of France, which he considered a lost cause. Many of the ships that had returned from Dunkirk were under repair. In the post-Dunkirk confusion, it was easier for the embassy in Bordeaux to request help from cargo ships than from the army, a choice made entirely at the initiative of the local authorities.

A detachment of the RAF land forces, armed with anti-aircraft guns, was deployed to ensure the security of the convoy. A canon for targeting submarines was also installed in the stern of the ship. The *SS Broompark* was crowded and only the officers had cabins. Food was also lacking on board.

1.6.3. Security measures

Security remained the main concern. Everyone on board witnessed the explosion of one of the many ships in the Gironde Estuary, as it flipped over and slowly sank. They did not know whether the ship had been torpedoed or had hit a mine. This incident strengthened the conviction that security measures were absolutely necessary to protect the passengers, heavy water and diamonds.

During the crossing, Lord Suffolk was informed that a convoy sailing around thirty kilometres from the *SS Broompark* had been attacked by the Luftwaffe. The sailors also saw light signals, probably from German submarines or a convoy escort. None of this reassured the crew and passengers.

There were not enough lifeboats or life jackets for all passengers, but the shipment contained cars seized by the British. The inner tubes of the tyres were used as improvised life jackets. During the crossing, all passengers had to take part in safety drills.

As there was not enough room for the heavy water and the diamonds in the lifeboats, Timbal suggested building a raft to save this precious cargo in the event of a shipwreck. Halban calculated the quantity of wood required to carry the crates and canisters, and Lord Suffolk built the raft himself, with the help of the ship's joiner.

Once ready, the raft was attached to a ladder using a cable, and the canisters of heavy water and two diamond crates were secured onto it. The canisters were placed in bags so that they could be attached more easily to the raft's planks. A watchman with an axe would cut the cable if the ship hit a mine or was bombed, letting the raft fall into the water. However, if the *SS Broompark* was torpedoed, the raft would sink with the boat, to avoid catching the attention of the submarine captain.

To recognise the great pains taken by those transporting the heavy water and diamonds, André Van Campenhout, who later became head of the International Monetary Fund legal department, wrote a document attesting to all of the measures taken by the parties concerned. Lord Suffolk and Major Golding signed as witnesses. This document was found in the National Archives in Kew (London) by Roy Martin, a British researcher and author of the book, *The Suffolk Golding Mission*. It mentioned the orders given to the sailors and all security measures associated with the raft.

The crossing therefore included a number of dramatic, improvised measures, but no incidents were recorded.

1.6.4. The fate of the diamonds

However, once the ship left the Port of Bordeaux, travelling north along the Gironde towards the advancing German Army, there was a great deal of tension on board. Fear dominated the atmosphere throughout the journey. The refugees heard the sound of aircraft overhead, but did not know whether or not they were German planes.

Early in the morning of 21 June, when Timbal felt the ship cease swaying as it headed into the bay of the Port of Falmouth, he almost shouted for joy. But even on British territory, he could see the scars of two sunken ships and wondered whether these boats had been bombarded by the Germans. He wanted the diamonds to be unloaded as quickly as possible.

However, his patience was sorely tested by the extremely strict controls of the British authorities, who wanted to prevent at any cost members of a "fifth column" infiltrating their country . Camille Huysmans, the socialist mayor of Antwerp, arrived at the same Port of Falmouth two days later on board the Léopold II, but could only disembark after a telegram from Clement Attlee, leader of the Labour Party.

Once in England, those transporting the heavy water and the Antwerp diamonds went their separate ways. The diamonds were transported by train to London and placed in a vault belonging to the Diamond Corporation. Timbal could finally relax with his family at the Mayfair Hotel, where he was a regular guest, but the manager barely recognised him because he and his family were covered in dust and dirt.

On 5 August, as the Battle of Britain began over London, a diamond inventory was drawn up by a British solicitor at the request of the Antwerp Diamond Bank, with a senior representative of British Customs, a representative of the Belgian Embassy, and Paul Timbal himself all in attendance.

The Antwerp Diamond Bank's annual report of 1945, the first after the war, openly described Paul Timbal's journey and stated the value of the diamonds as 100 million Belgian francs.

During the war, Timbal lived in New York, where he managed the Antwerp Diamond Bank branch. In autumn 1943, he wrote his report, probably at the request of his American friends to whom he had recounted his adventures, which is why the text was in English. The voyage aboard the *SS Broompark* takes up 25 pages of the original version's 263 pages. The writings of Mrs Nicolle, secretary to Major Golding, and Hubert Ansiaux, Inspector of the Belgian National Bank, provide similar, but more limited accounts.

1.6.5. Lack of preparation

In addition to an account of the journey on board the *SS Broompark*, Paul Timbal's report provides information that is interesting from a Belgian, Dutch, British or French perspective, part of which is outlined below.

Timbal explains why the evacuation of the diamonds, and indirectly the heavy water, was so improvised.

In the months before the German invasion, Belgium was well aware of the danger, but the diamond merchants were reluctant to draw up an evacuation plan. As a hard material, diamonds were strategic goods for use in the war industry. Jewellery could be traded easily and sold in neutral countries to finance spying or propaganda activities. The evacuation of the diamond sector with traders and specialist workers in France or the UK could be interpreted by Germany as an act of economic warfare, providing a pretext for invading the country. During the "Phoney War", German newspapers regularly published articles accusing Belgium of economic collaboration with the British and French. The establishment failed to draw up precautionary measures in order to maintain neutrality.

Furthermore, an evacuation plan could be seen as a sign of defeatism. Preparing for the evacuation of strategic goods could suggest a lack of confidence in the country's defence. This same fear of unnecessarily creating public alarm also prevailed in France. This consideration probably played a role, too, at the Marie Curie Institute where the heavy water was stored. We must not forget that people were expecting a long conflict and the *blitzkrieg* took everyone by surprise.

Once the decision to evacuate the diamonds to France had been made in consultation with the Belgian government, Timbal could count on the collaboration of the French authorities, receiving, for example, a safe-conduct pass from the French Embassy, despite the fact that the sales attaché was suspicious about the fact that Timbal could not give him the exact value of the diamonds. He considered practices in the diamond sector to be very odd.

1.6.6. "Diamonds are forever"

On 13 June, Timbal returned from his assignment to London, where the decision had been made to evacuate the diamonds to the UK if the military situation in France deteriorated. His plane landed close to Châteaudun, and Timbal and a few other passengers had to make their own way to Poitiers, where the Belgian government-in-exile was based. The surrender of the Belgians had enraged the French population and it was only after the intervention of a young lieutenant in the British secret service, whom Timbal had met in the plane, that the commander of a military convoy agreed to let the Belgian banker board a truck carrying Admiral Darlan's champagne reserves. According to Roy Martin, this lieutenant was most likely Ian Fleming, author of the James Bond books. We know for certain that Fleming was in Bordeaux during preparations for the *SS Broompark* expedition, and he always stated that the adventures of Agent 007 were based on true stories. This would suggest that Timbal's mission inspired him to write *Diamonds are Forever*.

Timbal had no problem convincing the Belgian ministers of the need to evacuate the diamonds to the UK, but the president of the Antwerp Diamond Federation was categorically opposed to it. He was so convinced that the French Army would succeed in stopping the German

offensive that he only conceded under pressure from the Belgian government. No Belgian diamond merchants took part in the voyage aboard the *SS Broompark*, despite initial plans to the contrary.

Timbal's account helps explain the widespread confusion and indecision in the light of the turbulent events of May and June 1940.

Chapter 2: The Spirit of Resistance and the Beginnings of the French Atomic Energy Commission

2.1. Clandestinity and national sovereignty

Georges-Henri Soutou[*]

The major military nuclear efforts around the world were, naturally, secret. France's was also largely clandestine or covert until, it might be said, the first explosion in 1960 and the *Loi de Programme* (Program Act) enacted that year. Not clandestine with respect to the government, the armed forces, or the other sectors concerned, but with respect to opinion, parliament, and the normal rules of public accounts and accountability. As we will see, many of the people in charge of this research effort had had plenty of experience of this sort of clandestinity, since 1940.

When General de Gaulle set up the *Commissariat à l'Énergie Atomique* (the CEA, France's Atomic Energy Commission as it was then known), we know that he also had the military atom in mind. But after him, the leaders of the Fourth Republic were convinced for a long time either that it was beyond France's means (as the British regularly whispered in French ears[380]), that it was unnecessary within the context of NATO, or indeed that it was bad *per se*: we too often forget that most French leaders in 1946 and the following years were in favour of collective security, the UN, and disarmament.

2.1.1. The stages in and the reasons for the (clandestine) acceptance of the military nuclear option

An eye was kept, of course, on Soviet progress, which was part of the overall geopolitical context. The first explosion of a Russian fission bomb in 1949 took everyone by surprise. As a result, early in 1950, President Truman decided to launch production of a thermonuclear weapon. The first American test was conducted in 1952, but it was a laboratory weapon that was impossible to use militarily. In 1953, the Soviets tested a weapon that was less perfect from the nuclear physics point of view and was not purely thermonuclear, but that was air-transportable, that was based on an entirely different physics principle, and that was more usable *per se* from the military point of view than the 1952 American model. In 1954, the United States had an operational H bomb explode, and in 1955 the Soviets tested an operational and fully thermonuclear bomb. They were then only one year behind, and, since they had chosen a different physics route, their progress no longer owed anything to

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[380] See a conversation between Jean-Marie Soutou (Principal Private Secretary to Pierre Mendès France who was the French Minister for Foreign Affairs at the time) and Anthony Eden, Foreign Secretary, in London, on 28 September 1954, Jean-Marie Soutou, *Un diplomate engagé. Mémoires 1939-1979*, Éditions de Fallois, 2011, p. 108-109.

espionage. It is now known that, from the outset of their programme, they were aiming for the thermonuclear fusion stage (perhaps like the Germans from 1939 to 1945 or others since). I am not sure that the CEA was aware of this, or that, at the time, it fully understood the scale of the Soviet effort. The military were doubtless more aware of it: I remember seeing a naval attaché arrive in Moscow in 1957 who had technical qualifications in nuclear physics (he had a "*brevet technique de physique nucléaire"*). In any event, it was not the sole factor, or even the main factor, in the French decision to go nuclear.

The reasons that led the French leaders to take this decision were manifold. Actually, the way was paved to it for those in the know since a major five-year nuclear plan was adopted in 1952, the aim of the plan being to produce over 50 kilograms of plutonium per year (enough to make five or six bombs) by the end of the 1950s. But the decisive factor was the Americans adopting, in 1954, the "New Look" strategy of massive nuclear retaliation, and that strategy being extended to NATO in December 1954. Henceforth, nuclear weapons (both strategic and tactical) would no longer be weapons of last resort in the event that conventional defences failed, but rather they would be used as from the start of a conflict. From then on there would be two types of country: nuclear countries (in the West, the United States and the United Kingdom, since 1952, the essential benchmark for comparison at the time for the French) and the others. France would be relegated, and would no longer have any real weight within NATO or internationally, and would be practically disarmed with regard to the USSR if it did not also equip itself with nuclear weapons.

But alongside these considerations, the archives show another factor: the desire to preserve a margin of superiority over Germany, which was given access to conventional *but not nuclear* weapons under the Paris Agreements (Bonn-Paris Conventions) signed in October 1954. An essential guarantee made by Mendès France in view of the new status of the Federal Republic of Germany was the decision taken on 26 December 1954 to equip France with a nuclear arsenal.[381] There is no doubt that that decision was taken then, even though, a few days later, Mendès France decided not to formalise it immediately for reasons of political timing. In any event, the CEA immediately had to start implementing it, in a semi-clandestine manner, in particular by setting up, three days later, the *Bureau d'Études Générales* (General Studies Office), the forerunner of the *Direction des Applications Militaires* (Military Applications Division). Naturally, this is barely conceivable today, but the German factor was decisive for many of the leaders. And it is hardly surprising if we remember that not ten years had gone by since the end of the war.[382]

The final stage was the upsurge in European co-operation from 1955-1957, with the Treaties of Rome (European Economic Community and Euratom). It should be understood that the negotiations were very difficult and almost failed: Germany did not want to accept Euratom (the European Atomic Energy Community), and France was putting all sorts of conditions on

[381] Georges-Henri Soutou, "La politique nucléaire de Pierre Mendès France", *La France et l'atome*, edited by Maurice Vaïsse, Bruylant, Brussels, 1994.

[382] Georges-Henri Soutou, *L'Alliance incertaine. Les rapports politico-stratégiques franco-allemands*, 1954-1996, Fayard, 1996.

the Common Market. What made it possible to break down the resistances was, first, the essential and continuous commitment of Chancellor Adenauer in favour of Franco-German reconciliation, and also his strategic vision and his will to reinforce Europe as a whole in the face of the Soviet threat (which re-emerged markedly with the events in Eastern Europe in the autumn of 1956), and the growing hesitations of US policy in the face of the development of the USSR's strategic nuclear might. The decisive turning point in this field was the Suez Crisis of November 1956, which convinced the French and German leaders to overcome the technical obstacles and to thrash out the agreements on the Common Market and on Euratom, in order to reinforce the Europeans with regard both to the Soviets and to the Americans. The high spot was Adenauer's visit to Paris on 6 November 1956, at the most dramatic moment in the Suez Crisis, on the day when France, following the UK, was forced to abandon the operation; the conversations that then took place between Adenauer and French Prime Minister (president of the Council of Ministers) Guy Mollet were crucial for overcoming the problem of the French military nuclear possibilities with respect to Euratom (up until then, France's partners wanted the members of the European Atomic Energy Community to give up the possibility of any military activity). From then on, it was agreed that France could continue its military effort.[383]

2.1.2. In November 1951, Pierre Guillaumat was appointed chairman of the CEA to take it into the era of industrial (and military!) projects

Since its origins, the CEA's three priorities had been training researchers, measuring a certain number of nuclear constants, and prospecting for uranium ore, which was considered at the time as extremely rare and was only found in significant quantities in France in 1948. There was still a great deal of hesitancy about going beyond those priorities. At the last meeting of the Atomic Energy Committee to be held during the life and under the chairmanship of Dautry, on 11 July 1951, Francis Perrin, the High Commissioner, was only sure about one thing: it was not a good idea to start building a reactor that was essentially intended to produce plutonium because that would have been a "waste of energy", extracting the plutonium would have been very difficult, and the product would excite the appetite of the military.[384]

Everything changed and the hesitations were left behind with the appointment of Félix Gaillard on 11 August 1951 as Secretary of State for the CEA to the Prime Minister (president of the Council of Ministers). On 21 August, Dautry died. On 6 September, and 2 and 18 October, Gaillard convened the Atomic Energy Committee at Matignon (the French Prime Minister's residence) and persuaded it to go beyond the strict long-term scientific concerns

[383] Georges-Henri Soutou, "Les problèmes de sécurité dans les rapports franco-allemands de 1956 à 1963", *Relations internationales*, no. 58, summer 1989.

[384] *PV du Comité de l'énergie atomique du 11 juillet 1951, Archives du CEA* (Minutes of the meeting of the Atomic Energy Committee of 11 July 1951, CEA Archives). On this attitude by Perrin and the scientists from the CEA, cf. the critical memoirs of Yves Rocard, *Mémoires sans concessions*, Grasset, 1988, p. 164. On the scientific, administrative, and political backgrounds of this issue, after Joliot-Curie was dismissed on 26 April 1950, and CEA was reorganised in April 1951 with the High Commissioner (and therefore the scientists) being placed under the authority of the chairman, c.f. Spencer Weart, *La grande aventure des atomistes français*, Fayard, 1980, p. 359 ff.

and to adopt an ambitious and rapid plan for developing nuclear energy, which should lead to a significant plutonium output, for two purposes in the minds of the time, namely civil and military.[385]

To implement this programme, Félix Gaillard wanted, in particular, to appoint as chairman of the CEA a man who was used to major industrial projects. Initially, he thought of Louis Armand, but he declined and proposed an engineer who was his junior at the *Corps des Mines,* an elite body of graduates from France's prestigious *École des Mines* engineering school or from other "*grandes écoles"* such as the *École Polytechnique*, namely Pierre Guillaumat, who was then France's *Directeur des Carburants* (director of Fuels).[386] Gaillard himself came to appoint him to his new office at the meeting of the Atomic Energy Committee that was held on 8 November 1951 and at which final approval was given to the five-year nuclear development plan that the National Assembly (the French parliament's lower house) was to vote on in July 1952, and which included, in particular, developing prospecting, and building two plutonium piles and a plutonium extraction facility.[387]

Pierre Guillaumat had a lot of experience in working clandestinely: having graduated from the prestigious engineering school, the *École Polytechnique*, he was mobilised in 1939 in the Air Section of the SR (*Service de Renseignement*, France's Intelligence Service), in Tunis. After the defeat of France, he became director of the *Service des Mines* of Tunisia, while also having an important role in a network working under the Vichy France *Service de Renseignement* and that spied on Italians and Germans in the Mediterranean. In 1943, he joined, in Algiers, the head of the Free French *Bureau Central de Renseignements et d'Action* (BCRA, Central Bureau of Intelligence and Operations) for that city, who was André Pélabon, a fellow *École Polytechnique* graduate. He continued to work at the new *Direction Générale des Services Spéciaux* (DGSS, General Directorate for Special Services) after the secret services were merged in December 1943. He worked in the South Zone, before becoming director of Fuels. An intelligence officer, he organised many operations at the CEA according to all the rules of clandestine work, surrounding himself to a large extent with assistants who had had similar career paths and using his wartime contacts with the military.

The arrival of Pierre Guillaumat at the CEA was part of the process of the CEA going into industrial projects. In addition, the payroll of the CEA grew from 1,800 to 10,000 employees from 1951 to 1958. Among the first major decisions of the new chairman was to reorganise the industrial activities of the CEA, with, on 4 September 1952,[388] the setting-up of an Industrial Division (*Direction Industrielle*) entrusted to Pierre Taranger (an *École Polytechnique* graduate who was also from Fuels, and a companion from the Intelligence Service days in Tunis!); the appointment of Jacques Yvon, an academic, deported to Germany in 1943, as Head of the Piles (Reactors) Department (*Département des Piles*); and the appointment of

[385] Bertrand Goldschmidt, *Pionniers de l'atome*, Stock, 1987, p. 449 ff.

[386] *Ibid.,* p. 451, and Henri Teissier du Cros, *Louis Armand visionnaire de la modernité*, Odile Jacob, 1987, p. 203.

[387] *PV du CEA du 8 novembre 1951* (Minutes of the Meeting of the Atomic Energy Committee of 8 November 1951).

[388] *PV du CEA du 4 septembre 1952* (Minutes of the Meeting of the Atomic Energy Committee of 4 September 1952).

Jacques Mabile, also an *École Polytechnique* graduate, as head of the Prospecting and Mining Division (*Direction des Recherches et Exploitations Minières).* We should remember that looking for and preparing uranium was still far from being CEA's priority, that metal still being considered at the time to be rare.

In addition, at the end of 1952, Guillaumat set up the *Comité des Mines* (Mining Committee), chaired by Professor Marcel Roubault (an academic who was not an *École Polytechnique* graduate!), who had discovered the La Crouzille deposit in 1948, and a *Comité de l'Equipement Industriel* (Industrial Facilities Committee), composed of representatives from industry, and he entrusted the chair of that committee to Louis Armand, his superior from the *Corps des Mines*, a member of the French Resistance and a Companion of the Order of Liberation (*Compagnon de la Libération*).

2.1.3. The role of Pierre Guillaumat in the expansion of the CEA's activities from 1954 to 1958

The nuclear plan of 1952 must have quickly appeared as inadequate. The *Plan de Développement Général 1955-1957* (1955-1957 General Development Plan), which amounted to tripling the funding earmarked in 1952, was adopted by the Atomic Energy Committee on 5 May 1955, under the chairmanship of Gaston Palewski, Minister Delegate for Atomic Affairs (*Ministre Délégué Chargé des Questions Atomiques*) and clearly General de Gaulle's "eye"). Gaston Palewski emphasised that the new plan should make it possible to "create the infrastructure that should lead France to the pre-industrial use threshold".[389] However, while a formal decision to produce the bomb was still absent, the military potentialities of the "development plan" were not concealed by the participants at the meeting. Doubling the Marcoule G2 graphite pile (reactor) with the G3 pile made it possible to produce tens of kilograms of plutonium every year, and it was understood that, if necessary, the plan "could rapidly be redirected towards national defence uses",[390] as indicated by Palewski.

The large amounts of funding earmarked by the plan denote a certain balance between the civil and military objectives. Out of a total of 85.5 billion francs (in addition to the 37.7 billion francs earmarked in 1952), 60.9 went to infrastructures of interest both for the civilian atom and the military atom (33.9 billion for producing nuclear materials, including heavy water and enriched uranium, and 27 billion for the Marcoule plutonium generation centre), 19 billion for research into nuclear-propelled submarine power systems, and 15.6 billion for research and new sectors.[391] It is certain that the role of Guillaumat was crucial in having this ambitious

[389] *PV du CEA du 5 mai 1955* (Minutes of the Meeting of the Atomic Energy Committee of 5 May 1955).

[390] *Ibid.*

[391] *PV du CEA du 5 mai 1955* (Minutes of the Meeting of the Atomic Energy Committee of 5 May 1955); Georges-Henri Soutou, "*La logique d'un choix: le CEA et le problème des filières électro-nucléaires*, 1953-1969", *Relations Internationales*, no. 68, winter 1991; *memo CEA du 5 mai 1955* (CEA memo of 5 May 1955), *Papiers Guéron* (European Union Archives, Florence), DEP 3; 53.

programme approved by Palewski and, through him, by the French government, which adopted it by decree on May 1955.

In addition, the scheduled funding terms and procedures were a masterpiece of concealment. Of the 85.5 billion devoted to the additional plan, only 48.5 came from the CEA's budget. Other government departments supplied 20 billion. The documents given to the members of the Atomic Energy Committee stipulated that 9 billion was coming from the French Navy for the submarine propulsion system, and 6.4 billion earmarked for Marcoule was manifestly coming from the French Ministry of Defence. On 20 May 1955, a secret protocol was to be signed between the CEA and the French Ministry of Defence, mentioning the third plutonium-generating reactor of Marcoule and the plutonium extraction plant.[392] Actually, the protocol made provision for 20 billion francs to be paid over a three-year period to CEA from the Defence budget.[393]

In addition, 17 billion francs of the plan were totally off-budget. It was understood that that off-budget amount would be funded by EDF and by industrial groups, in particular for the investment necessary to produce raw materials. But that strategy was to prove to be difficult to implement and caused a genuine financial crisis in the spring of 1956.[394] Finally, Guillaumat managed to obtain from the French Finance Minister in July 1956 the budget allocations he had asked for in April for 1956 and 1957, and more besides, i.e. 13 billion francs. We should remember that it was in July 1956 that Guy Mollet decided, in spite of his initial hesitations, to continue the secret military nuclear programme.[395] It was worth it…

A constant concern for Guillaumat was to overcome the opposition of most of the great French atomic physicists to the military nuclear option. As late as in 1954, a delegation of them went to Pierre Mendès France to tell him they were refusing to work on the bomb. In addition, their representatives on the Atomic Energy Committee wanted to devote the budget allocations to fundamental (basic) research and not to applied research. The minutes of the meetings of the committee show that Guillaumat had to fight hard. Analysis of the use of the research funding that the CEA allocated to universities makes it possible to understand how he did it: almost all of the budget allocations went to laboratories whose heads sat on the committee.

Pierre Guillaumat also played a decisive part in preparing the second five-year atomic plan for the period from 1957 to 1961, in particular at informal meetings between members of the Atomic Energy Committee and directors of the CEA at the CEA guest-house in Gif-sur-Yvette on 14 September and in Saclay on 9 November 1956. It should be recalled that these meetings took place during the Suez Crisis, which, in addition to relegating France relative to the superpowers, emphasized its energy dependency on Middle East oil. The second plan, voted

[392] Marcel Duval and Dominique Mongin, *Histoire des Forces nucléaires françaises depuis 1945*, PUF, Collection Que Sais-je ?, 1993, p. 36.

[393] *Note CEA du 5 mai 1955* (CEA memo of 5 May 1955), *Papiers Guéron* (European Union Archives, Florence), DEP 3; 53

[394] On the seriousness of this crisis, cf. the Minutes of the Meeting of the Atomic Energy Committee of 5 July 1956 (*PV du CEA du 5 juillet 1956*).

[395] Marcel Duval and Dominique Mongin, *op. cit.*, p. 37.

through by the French parliament in July 1957, was allocated nearly 500 billion old francs. In particular, it was indicated that the plutonium option would be continued in order to come rapidly to the stage when nuclear power stations could be commissioned (and secretly of course also to the stage when the bomb could be produced), and that an isotope separation plant would be built, expressly intended for meeting both civil and military needs.[396]

The terms of funding of the plan corresponded entirely to the "creative" conceptions of Guillaumat. First, there was going to be a central programme covering the research, the prototypes, and the plutonium option, funded with 334 billion old francs and corresponding to the core nuclear tasks proper. There would be 80 billion old francs in programmes ordered, essentially by the French National Defence authorities, and finally there would be 76.4 billion old francs in off-budget programmes, including 32 billion from EDF (France's electric utility), with the balance being provided by investment from private industry in mining, ore processing, and producing nuclear materials, in particular uranium and heavy water. CEA's particular financial status would make it possible to continue the wartime concealed budget techniques.

École Polytechnique, plus the will for *erga omnes* national sovereignty and independence, plus experience of clandestinity: such was the winning formula! And above all because General de Gaulle was totally behind the project: when asked a question at a meeting of the Atomic Energy Committee on the huge commitments brought by the first Programming Act for the period from 1960-1964, Pierre Guillaumat was able to answer: "Money is not a problem". Simplicity is an essential quality for any scientific demonstration.

[396] Georges-Henri Soutou, "*La logique d'un choix : le CEA et le problème des filières électro-nucléaires, 1953-1969*", *op. cit*.

2.2. Human and material resources serving national independence: the spirit of Resistance and the beginnings of the CEA

Patrick Boureille[*]

With the Liberation of France came not only the realisation that the country was ruined financially, but also the awareness of how far behind its German-speaking foes and its English-speaking allies France was both scientifically and technologically. Concluding his "*Note sur la bombe uranium*" (Note on the Uranium Bomb), published in the July 1945 issue of *Mémorial de l'artillerie française*, and therefore before the explosions of Hiroshima and of Nagasaki, Lieutenant Colonel Sabatier from the *Service Technique de l'Armée de Terre* (the French Army's Technical Section) emphasised how far behind French research had fallen during the Second World War. "The painful legacy is that, in France, since 1940, no work on the subject has been able to be continued, while everywhere else research has been continuing fiercely and relentlessly". The burden of that legacy was even heavier to bear since "six years of wartime for a country having all of the resources (scientists, researchers, materials, etc) correspond easily to a generation of peacetime".[397]

Ever since June 1940, restoring national sovereignty had been the *raison d'être* of Free France. Since the meeting between the French atomic scientists and General de Gaulle in Ottawa in July 1944, mastering atomic energy had been at the core of the concerns of the Provisional Government of the French Republic.[398] *Mutatis mutandis*, these concerns have remained, regardless of the governments, for seven decades.

This short presentation intends to illustrate how the spirit of the Resistance was mobilised to serve the cause of national sovereignty and independence during the first two decades of existence of the *Commissariat à l'Énergie Atomique* (CEA). Since the leading scientific lights of the CEA have already been the subject of numerous studies, and some of them have also written numerous works, we will talk about certain research fields that were essential during those pioneering times.[399]

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[397] Lieutenant Colonel Sabatier, "*Note sur la bombe uranium*", *Mémorial de l'Artillerie française*, 1946, vol. XX, 2nd fascicule, no. 76, Paris, *Imprimerie Nationale*, p. 435-459.

[398] Bertrand Goldschmidt, *Le complexe atomique. Histoire politique de l'énergie nucléaire*, Arthème Fayard, 1980, p. 71-72; Charles de Gaulle, *Mémoires de guerre*, vol. II: *L'unité (1942-1944)*, Paris, Plon, 1956, p. 242. For a presentation of French nuclear research and its contribution to the Allied war effort, Spencer R. Weart, *Scientists in Power*, Cambridge, Massachusetts, Harvard University Press, May 1979, translated into French under the title *La grande aventure des atomistes français*, Paris, Fayard, 1980.

[399] In addition to Spencer R. Weart, already mentioned, Michel Pinault, *Frédéric Joliot-Curie*, Paris, Odile Jacob; Bertrand Goldschmidt, *L'aventure atomique*, Paris, Fayard, 1962; *Le complexe atomique*, *op. cit.* and *Pionniers de l'atome*, Paris, Stock, 1987.

2.2.1. The obsession with having control over the raw materials

"A leader, a mission, and means": these strong words, of military essence, took on all of their meaning in the early days of the CEA, when budgets, scientific skills, and material resources had to be focused on "continuing the research with a view to using atomic energy in the various fields of science, of industry, and of National Defence…"[400]

As French knowledge stood in 1940, uranium ore and deuterium were two elements that were essential to creating an atomic pile. At the Liberation, the stocks available to researchers were thin on the ground: a railway truck of impure uranate had remained throughout the war at Le Havre station, i.e. three tons of uranium oxide, to which eight tons could be added that had been lent in 1939 by the *Union Minière du Haut-Katanga*, a Belgian mining company, and hidden in a disused phosphate mine in Khouribga in Morocco during the Occupation.[401] The situation was of even more concern since the United States had made a deal with the Belgian government that ensured it had control of the Shinkolobwe deposit in Congo[402] and since the Soviet troops were camped at Joachimsthal (Jachymov) in Czechoslovakia.[403] It was then that the CEA set up its *Direction des Recherches et Exploitations Minières* (DREM, its Prospecting and Mining Department) whose staff combined intelligence and resourcefulness to make up for the lack of material resources they were given as they went to study the various known mineralogical curiosities in France and Overseas (autunite in the Morvan area of France, chalcolite in the Forez area of France, and niobotantalate and uranothorianite in Madagascar).[404]

The Prospecting and Mining Department took over from a commission of the CNRS (France's National Centre for Scientific Research), which was in charge of studying mineral resources in France and its colonies, and that was set up on 11 December 1944 on the advice of Louis Barrabé and Jean Orcel, at a time when the director of the CNRS was none other than Frédéric Joliot-Curie.[405] To lead this section, the Minister for Reconstruction, Raoul Dautry, went in the

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[400] *Journal officiel de la République française* (France's Official Journal), *Ordonnance* no. 45-2563 of 18 October 1945, published on 31 October 1945, p. 7065-7066, and Decree no. 45-2572 of 18 October 1945, p. 7079-7080; Aline Coutrot, "La création du Commissariat à l'Énergie atomique", *Revue française de science politique*, 1981, vol. 31, no. 2, p. 343-371.

[401] Robert Bodu, *Les secrets des cuves d'attaque. Quarante ans de traitement des minerais d'uranium*, Vélizy-Villacoublay, éditions COGEMA, 1992.

[402] On the history of the *Union minière du Haut-Katanga*, Charles d'Ydewalle, *L'Union minière du Haut-Katanga : de l'âge colonial à l'indépendance*, Paris, Plon, "*Histoire des grandes entreprises*", 1960; René Brion, *Les archives de l'Union minière du Haut-Katanga*, *Archives générales du Royaume de Belgique* (General Archives of the Kingdom of Belgium), 1996.

[403] Cédric Lheur, "Hommage à Marcel Roubault (1905-1974). L'uranium et le pôle de géosciences de Nancy", *Cahier des Micromonteurs*, 2006, *bulletin spécial de l'Association française de microminéralogie* (special bulletin of the French Association of Microminerology), "*Minéraux dédiés à des minéralogistes français ou à des localités françaises*", no. 93, p. 89-113.

[404] Antoine Paucard, *La mine et les mineurs de l'uranium français,* vol. I, *Les temps légendaires (1946-1950)*, vol. II, *Le temps des conquêtes (1951-1958)* and vol. III, *Le temps des grandes aventures (1959-1973)*, Éditions Thierry Parquet, 1992, 1994, 1996; Pierre-Christian Guiollard and Bernard Bavoux, *L'uranium de la Crouzille (Haute Vienne),* 1998; by the same authors, *L'uranium du Lodévois (Hérault)*, 1999; Pierre-Christian Guiollard, *L'uranium du Morvan et du Forez*, Fichou, published at the author's expense, 2002.

[405] Girolamo Ramunni, "La réorganisation du Centre national de la Recherche scientifique, 7 septembre 1944", *Revue pour l'histoire du CNRS*, no. 3, Novembre 2000; Denis Guthleben: "La participation du Centre à l'effort scientifique de guerre à la Libération. Quand le CNRS reprend les armes…", *Revue pour l'histoire du CNRS*, éditions du CNRS, no. 14, May 2006.

spring of 1945 to the *Service des Mines* (Mines Service), who proposed André Savornin for the job. A decorated member of the Resistance (having been awarded the *Médaille de la Résistance*) and a Gaullist,[406] he was also an "*African*" who was working at the time in Gabon for the oil prospecting corporation *Le Syndicat d'Études et de Recherches Pétrolières* (SERP) which was then directed by Pierre Guillaumat.[407]

Two initiatives characterised the action of the first boss of French uranium: first, he set up the CEA's *École de Prospection* (Prospecting School) on 2 December 1945 on the premises of France's Natural History Museum (*Muséum d'Histoire Naturelle*). In 1955, it became the *Centre International d'Enseignement en Prospection et Valorisation des Minerais Radioactifs* (CIPRA) in La Crouzille.[408] He then organised prospecting expeditions in France and Overseas, first for the SERP, and soon after for the CEA, bringing together veteran adventurers from African Free France and geologists and mineralogists.[409]

Those efforts yielded limited results initially (10 tons by the end of 1948) but paved the way to the methodical successes of the teams of André Savornin's successor, Marcel Roubault, who was appointed as director of the Prospecting and Mining Department shortly afterwards. Frédéric Joliot-Curie's dream of sending "2,000 prospectors who would systematically scan our subsoil with Geiger counters, from the Pas-de-Calais to the Pyrenees" was realised and even exceeded: not a single uranium lead escaped the CEA and the 10,000 tons required to complete the national atomic programme were reached with the discoveries of deposits in Niger.[410]

Since France did not have large enough quantities of graphite of purity that was sufficient and comparable to that of the graphite used by the Americans for their Manhattan Project, the use of deuterium was essential. The deuterium issue was taken up in December 1944 by Raoul Dautry, who received a report commissioned from Jacques Allier.[411] On 29 March 1945, the day after an interview with Frédéric Joliot-Curie and Jacques Allier, Raoul Dautry submitted an *aide-mémoire* to General de Gaulle that laid out a research programme. In April 1945, Allier was sent on an assignment to London to meet with Norwegian Prime Minister Johan Nygaardsvold, and was authorised to enter into any agreement in the field of the Norwegian electrochemical industry. On 5 August, on an assignment to Oslo, he purchased five tons of

[406] Catherine Akpo-Vache, *L'AOF et la Seconde Guerre mondiale : la vie politique (septembre 1939-octobre 1945)*, Karthala, p. 113 ff.

[407] On Pierre Guillaumat during the war, see François Broche, Georges Caitucoli and Jean-François Muracciole (eds.), *Dictionnaire de la France Libre*, Robert Laffont, Collection Bouquins, May 2010, p. 724-725 ; Georges-Henri Soutou and Alain Beltran (eds.), *Pierre Guillaumat, la passion des grands projets industriels*, Institut d'histoire de l'industrie, éditions Rive droite, 1995, contribution by Pierre Péan "*Pierre Guillaumat, l'homme d'action*", p. 11-19.

[408] Jacques Blanc, "*Les mines d'uranium et leurs mineurs français : une belle aventure*", *Annales des mines, Réalités industrielles*, 2008/3 (August 2008), p. 35-43.

[409] Antoine Paucard, *La mine et les mineurs de l'uranium français…, op. cit.*, p. 6-11.

[410] Jacques Blanc, *art. cit*.

[411] On the action of Jacques Allier for evacuating heavy water from Norway in February and March 1940, cf. the contribution by Dominique Mongin to the present work.

heavy water.[412] From 1945 to 1955, France thus received more than one hundred tons of heavy water for completing its programme.[413] The contemporary Franco-Norwegian projects do not lie within the ambit of this presentation, even though they do follow on from the co-operation between two governments that had taken refuge in London in the dark hours of their respective histories.[414]

The fear, which was very much present in the minds of the French leaders in 1946, of a shortage of raw materials orchestrated by their American ally thus disappeared completely during the decade that followed, giving way to a feeling of abundance. We then genuinely went from the time of "*legends*" to the time of *"conquests*", to quote the titles of the first two tomes of the geological saga written by Antoine Paucard.[415]

2.2.2. The imperium of the Free French over the nuclear sector

The CEA consists of a combination of individuals with various career paths working to master atomic energy in the service of national sovereignty and independence. Civilian or military, and in the latter case, career or conscripted during the Second World War, many of the staff who joined the CEA had their paths attached to the Resistance during the period from 1940 to 1944.[416]

However, among the staff with military backgrounds, few career officers who had remained in the home country of France during the years of Occupation joined the new scientific establishment. As from a certain grade (meaning they had responsibilities within the Vichy Regime), they were "victims" of a very relative purge and of measures for laying off executives that were essentially driven by the dramatically poor state of finances. The start of the military operations for re-establishing French sovereignty in Indochina mobilised many troops, who were all career personnel. Thus, the prosopography of the French naval officers placed on *congé d'armistice* (armistice leave) after the invasion of the *zone libre* (free zone) of France in November 1942 shows that a considerable number of them became students of a range of France's prestigious *grandes écoles*, as varied as the *Laboratoire de Physique Théorique de la Sorbonne* or the *Institut d'Études Politiques de Paris*. Thus, 59 of them studied at the *École Supérieure d'Électricité de Paris*, at the *Institut Polytechnique de Grenoble* and at the *Centre*

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412 Aline Coutrot, "*La création du Commissariat à l'Énergie Atomique*", *Revue française de Science politique*, year 1981, vol. 31, no. 2, p. 343-371.

413 Ole Kristian Grimnes, Russel J. Renneberg and Bertrand Goldschmidt, "The supplies of heavy water to France and the early development of nuclear energy", *Norwegian Institute for Defence Studies*, 4/1995.

414 Excerpt from the report made by Jacques Allier on 4 May 1945 cited by Michel Pinault, *op. cit*, p. 292. It was the Norwegians who, as from 1948, through fear of an over-hostile reaction from the United States, no longer answered the pressing appeals from Raoul Dautry to found a European nuclear industry that was independent from the two superpowers. A Norwegian cabinet meeting of March 1950 refused the French project for a bilateral agreement on uranium. Astrid Forland, "Norway's nuclear odyssey: from optimistic proponent to non-proliferator" in *The Nonproliferation Review*, winter 1997, vol. 4, no. 2, p. 6-8.

415 Antoine Paucard, *La mine et les mineurs de l'uranium français…, op. cit.*

416 Guillaume Piketty and Jean-François Muracciole (eds.), *Encyclopédie de la Seconde Guerre mondiale,* Robert Laffont, Bouquins, 2015. Notices "*Les programmes atomiques*" and "*L'avènement de l'ère nucléaire*", p. 1045-1048 ; 887-893.

National de la Recherche Scientifique (CNRS), but only one of them, the first-class mechanical engineer André Ertaud, joined the CEA as soon as it was set up. And he worked at the *Laboratoire de Physique Expérimentale* of the *Collège de France* under the direction of Maurice de Broglie from 1943 to 1945. He distinguished himself during the western Allied invasion of Germany when he recovered the documentation, equipment and scientific personnel "neglected" by the Americans of the Alsos mission.[417] In reality, those members of the military had been placed in the *grandes écoles* and research institutes in early 1943 to keep them safe from the threat of being deported to Germany on *Service du Travail Obligatoire* (Compulsory Work Service), and they resumed their military careers at the Liberation.

Alongside Lew Kowarski, André Ertaud was at the centre of the development and construction of the ZOÉ pile (ZOÉ being a French acronym for zero energy, uranium oxide, and heavy water) from 1947-1948, and, from December 1948, he was in charge of managing the department for operating the pile. That department was formed of a team of about ten people whose activity was focused on the calculations for the structure of the pile (shape, protection, neutron diffusion) and on taking the first measurements. As part of the redistribution of responsibilities that took place in 1949, the department produced radio-isotopes either for other CEA departments or for external entities.

Military staff who were detached (placed in an *hors cadre* situation) at the end of the 1940s joined André Ertaud. This applied to frigate captains Pierre Théréné and André Goua and to chief engineer René Lescop. Seconded from 1 April 1948 to the atomic synthesis laboratory of Frédéric Joliot-Curie, Pierre Théréné held, from 1 October 1950, the office of head of the Madagascar Mission, and then of head of all CEA prospecting in Africa in 1956.[418] The career of André Goua advanced in parallel with the career of Pierre Théréné: a Reserve Frigate Captain, as of 1 February 1952 he was in charge of the prospecting mission in French Equatorial Africa on behalf of the Prospecting and Mining Department (DREM) until 1955. He then took over from Pierre Théréné in Antananarivo until 1963 and ended his career as head of the entire "Africa-Madagascar department of DREM from 1963 to 1965.[419] The career of Chief Engineer 2nd Class, Maritime Engineers, René Lescop is more original: he took over from Léon Denivelle as secretary-general of the CEA and stood in for Raoul Dautry in 1951.[420]

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[417] Patrick Boureille, *La Marine française et le fait nucléaire (1945-1972)*, history PhD thesis under the direction of Georges-Henri Soutou, Université de Paris-IV, p. 33 ff. *Service Historique de la Défense*, *Centre des Archives Historiques de Vincennes (SHD-MV)*, sub-series CC7 4th Modern, box no. 997, folder no. 5: André Ertaud.

[418] SHD/M/V, CC7 4th Modern, box no. 2110, folder no. 4: Pierre Théréné; decision no. 293 CAB/MIL/DAM of 3 April 1948.

[419] SHD/M/V, CC7 4th Modern, box no. 1796, folder no. 3: André Goua.

[420] SHD/M/V, CC7 4th Modern, box no. 2436, folder no. 4: René Lescop; decision no. 11 704 CAN/P of 21 August 1948, signed Joannès Dupraz. On Léon Denivelle and his role in the French Resistance, see Claudine Fontanon and André Grelon, *Les professeurs du Conservatoire National des Arts et Métiers. Dictionnaire biographique 1794-1955*. Through his activity conducive to *École Polytechnique* graduates arriving to the detriment of the original pure scientists, the appointment of René Lescop as secretary-general of the CEA was perceived as a defeat for Frédéric Joliot-Curie, according to Bertrand Goldschmidt: "Quand deux courants idéologiques de la Résistance s'affrontent après-guerre..." (Bertrand Goldschmidt, *Pionniers de l'atome*, p. 442 ff.).

The French Resistance was, however, able to provide some prestigious and useful supports for the CEA during the first two years of its existence. Generals Dassault and Ailleret are examples of such supports. Darius-Paul Bloch was a genuine hero of the Resistance, under the alias of Dassault.[421] From January 1945, he ran the *Comité de Coordination de la Recherche Scientifique de la Défense Nationale* (CCRSDN, the Committee for Coordinating Scientific Research for National Defence), and, in that capacity, he was a *de jure* member of the *Comité de l'Energie Atomique* (Atomic Energy Committee) from 1946 to 1949. On 8 October 1945, he was given a first awareness-heightening report on the feasibility of an atomic weapon by Frédéric Joliot-Curie. In tune with the official position of the French government, as proclaimed before the United Nations on 17 March 1946, General Dassault deemed that "France, due to its small surface area and to its centralisation, naturally has every interest in seeing the use of the atomic bomb banned [...]. It is not impossible that one or more nations might not bow to the desire to see the atomic weapon banned, and it is France's duty to consider all eventualities".[422] The period of respite estimated at a maximum of five years during which the international negotiations had real possibilities of succeeding appeared to him to be conducive to continuing scientific research into atomic energy applications, regardless of whether the end use was peaceful or military. His successor Paul Bergeron gathered the fruits of this constant research and horizon-scanning work.

Another original career path is that of Charles Ailleret. A member of the *Organisation de Résistance de l'Armée* (Army Resistance Organisation) from the outset in 1942, he became the commander for the North Zone before being arrested in 1944 and deported to Buchenwald, from which he returned in 1945. In 1952, he took over the special weapons command of the French Army, that command becoming an inter-forces one in 1958, and he headed the operations leading on 13 February 1960 to the *Gerboise bleue* (Blue Jerboa) test at which the first A bomb was caused to explode in Reggane in the Algerian Sahara. *Chef d'Etat-Major des Armées* (French Chief of the Defence Staff), he organised the withdrawal of France decided by General de Gaulle from the integrated military command of NATO in 1966, and became the exponent of an "all-round' (*tous azimuts*) French nuclear defence capable of repelling attacks from all sides.[423]

However, most of the senior officers and generals who supported the action of the young CEA had served in the Free French ranks – those whom Jean-François Muracciole called "*l'autre Résistance"* (the other Resistance)[424] – and in the French Army of Africa (*l'Armée d'Afrique*).

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[421] *La Jaune et la Rouge*, no. 71, 1 April 1954, p. 30-33. Claude Carlier, "Général Paul Dassault : l'armement et les études techniques de l'état-major de l'Armée (1931-1945)", *Guerres mondiales et conflits contemporains*, 2011/2, no. 243, p. 93-102.

[422] Minutes of the Meeting of the Atomic Energy Committee of 24 July 1947, CEA Archives, DRI-F 3: 24-26 and 82-26. Information taken from Michel Pinault, *Frédéric Joliot-Curie*, Paris, Odile Jacob, April 2000, p. 384 ; p. 627.

[423] Charles Ailleret, *L'aventure atomique française. Comment naquit la force de frappe française*, Paris, 1968, Grasset. From the same author, "Défense dirigée" ou "défense tous azimuts*"*, *Revue de Défense nationale*, no. 263, December 1967, p. 1923-1932.

[424] Jean-François Muracciole, *Les Français Libres. L'autre Résistance*, Tallandier, 2009, Paris.

Their role was not a minor one. The names of a few personalities corresponding to different times in the existence of the CEA from 1945 to 1968 will suffice to illustrate.

The name of Pierre Guillaumat comes quite quickly to mind when we think about the heritage of the ideas of the Resistance in constructing France's system of deterrence. After having served in the networks of the BCRA (the Free French Central Bureau of Intelligence and Operations), he was head of the SERP (*Le Syndicat d'Études et de Recherches Pétrolières* – the oil prospecting corporation) until 1951. He was then appointed chairman of the CEA before becoming French Minister for the Armed Forces in June 1958. If he left that post in February 1960, it was to take up the office of Minister for Atomic Energy and Scientific Research, for the time necessary for the first five atomic tests.

Beyond Pierre Guillaumat, all of the Free French who were part of the atomic adventure should be on the roll of honour. Thus, in 1963, Yves de Daruvar, a veteran of the *ad hoc Régiment de Marche du Tchad* (*Ad hoc* Regiment of Chad – *Régiment de marche* refers to regiments built of units originally belonging to other regiments), and, in 1964, André Quelen, a veteran of the *ad hoc* 5th *Bataillon de Marche du Cameroun* (*ad hoc* Battalion of Cameroun), joined the senior administrative executives, as did Robert Galley, a veteran of the *501e Régiment de chars de combat* (501st Tank Regiment) and of the *2e Division Blindée* (2nd Armoured Division), who directed the design and engineering for the construction of the plutonium extraction plant at the Marcoule site in 1955 and of the uranium enrichment plant at the Pierrelatte site from 1958 to 1966. In parallel, Yves Rocard, a member of the Cohors-Asturies Resistance network set up by Christian Pineau, director of the Technical Section of the Free French Naval Forces (*Service Technique des Forces Navales Françaises Libres*), and scientific advisor for the military programmes of the CEA in 1947, co-ordinated, in that capacity, some of the major theoretical work for the nuclear military programmes.[425] It was also Jean Volvey, a veteran of the Free French Forces (*Forces Françaises Libres*), who directed the Pierrelatte plant from 1959 to 1973 and represented the CEA in Polynesia from 1973 to 1976, and Jean Crépin, former commander of the artillery of the 2nd Armoured Division (2e DB), whose nuclear explosives committee worked in close co-operation with the CEA. A final example is Jean Gemahling, one of the main "*combat"* executives who ended up as assistant manager of Nuclear Fuels and Equipment (*Sous-Directeur des Matériels et des Combustibles Nucléaires*). Finally, we should not neglect the presence of the "*quasi-Free French*", such as Yves La Prairie, who had graduated from the *École Navale* and from *Sciences Po* (Paris Institute of Political Studies) in 1923, and who joined the Free French Naval Forces (FNFL, *Forces Navales Française Libres*) in August 1943 (on the frigate La Découverte), a few weeks after the date of closure of the enrolments.[426]

These are but a few examples of career paths. Many others could be mentioned, as illustrious as those of Maurice Bourgès-Maunoury, military delegate to General de Gaulle for the South

[425] Yves Rocard*, Mémoires sans concessions*, Paris, Grasset, 1988, 306 p. SHD/M/V, sub-series CC 4th Modern, box no. 1312, folder no. 8: Yves Rocard.

[426] Jean-François Muracciole, *Les Français Libres, op. cit.,* p. 318-324. He coined the expression "quasi-Free French".

Zone in 1943, who, as Minister of Defence, supported the atomic effort of France's Fourth Republic, or of Félix Gaillard, initiator, in 1951, as Secretary of State to the French Prime Minister's Office (*Présidence du Conseil*), of the first five-year plan for developing atomic energy, and signatory, in 1958, as French Prime Minister (*Président du Conseil*), of the German-Italian-French agreements making it possible to fund the Pierrelatte plant.[427]

These extremely varied and different paths show the extent to which the spirit of the Resistance was able to innervate France's atomic project in the years immediately following the Second World War and up to the 1970s. Assuredly, we are entitled to posit the hypothesis of a powerful network of solidarities inherited from the French Resistance or from the Free French Forces (*Forces Françaises Libres*), in a field as sensitive as the nuclear one (but also in the aviation and oil industries), and which constitutes a still little-known facet of the years after the Second World War.[428]

We are borrowing the conclusion for this contribution from Jacques Chaban-Delmas, an indisputable figure of the French Resistance and of France's Defence Policy for the thirty years that followed the Liberation. In his memoirs, he sums up the motivation for his political action from 1946 to 1958 as follows:

> "Actually, my ministerial career under the Fourth Republic was guided throughout by my concern for keeping an eye on 'my' bomb. I only joined the Mendès Government on the condition that the research programme on the atomic weapon was continued. I accepted the position of Minister of State in Guy Mollet's Government in order to be able to keep an eye on things. And if I declared to Félix Gaillard, who was in the processing of forming his Government, that I felt it my duty to hold the National Defence portfolio, it was to better encourage even more ardour from all those who were working on the project. […] Producing the A bomb is the most measurable service that I have been able to render to France."[429]

Jacques Chaban-Delmas expresses in those words the concerns of all of the French who experienced June 1940 and who worked resolutely to ensure that the country would never suffer a similar tragedy.

[427] Paul Marcus, *Maurice Bourgès-Maunoury, un républicain indivisible*, Biarritz, 1997, Atlantica.; François Le Douarec, *Félix Gaillard (1919-1970) : un destin inachevé*, Paris, Economica, 1991. That work is based on the history thesis supervised by Professor Jean-Marie Mayeur of the Université de la Sorbonne-Paris-IV and defended in 1989: Samuel Cazenave, *Félix Gaillard*, *le Président,* Paris, Collection Mémoires d'homme, 2011.

[428] It was to make up for this gap in the French historiography of the "second" 20th century that Jean-François Muracciole, university professor at Montpellier III Paul Valéry, wrote the above-cited work *Les Français Libres, L'autre Résistance*.

[429] Jacques Chaban-Delmas, *Mémoires pour demain*, Paris, Flammarion, 1998; Jacques Mousseau, *Jacques Chaban-Delmas*, Paris, Perrin, 2000.

2.3. The spirit of Resistance and the beginnings of the CEA

François Geleznikoff[*]

This chapter takes me back to my youth and the time I joined the Atomic Energy Commission in 1974.

We were then in the midst of the Cold War, a war of a type different from the one that had preceded it, but whose common denominator lay in the role attributed to the nuclear weapon.

In one case, it had enabled the war to be ended, in 1945, and in the other, it had become a factor of peace and a keystone of international stability.

In other words, the spirit that fired our elders in Free France also drove us, naturally in very different circumstances, with the same will to give our country the guarantees of its own survival.

On joining the Military Applications Division of the CEA, I became aware that the baton was being passed from our elders who had been involved in the war effort to those who were now in charge of implementing nuclear deterrence on an everyday basis. "Never again!" (*Plus jamais ça!*) had been the leitmotif of the French Resistance during the war; the same refrain accompanied the creation of the CEA by General de Gaulle in October 1945, and then the secret launch of the French nuclear defence programme nine years later by Pierre Mendès France.

This spirit was all the more prevalent since the initial leaders of the military arm of the CEA often came from the French Resistance, with their experience of highly sensitive secret missions and their determination to achieve the goal set in the name of safeguarding the nation.

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In the collective memory of the Military Applications Division (*Direction des Applications Militaires*) of the CEA, the emblematic figure of the work on the defence nuclear sector is indisputably Pierre Guillaumat, chairman of the CEA from 1951 to 1958, and who then became the first Minister for the Armed Forces (*Ministre des Armées*) of General de Gaulle.

The son of a general, Pierre Guillaumat graduated from the *École Polytechnique* and chose the *Corps des Mines*. He was working in Tunisia at the start of the war, and joined the Air Section of the Intelligence Service (*Service de Renseignement Air*). There, he found himself alongside a certain number of other *École Polytechnique* graduates, including Pierre Taranger (future industrial director of the CEA), and became the head of that intelligence service section. Then he went clandestine, before rallying to the Gaullist movement by joining the *Bureau Central de Renseignements et d'Action* (BCRA, Central Bureau of Intelligence and Operations).

[*] Former Director of Military Applications at the CEA.

The document that gives Pierre Guillaumat's service record in the Resistance – and which is shown in the "Resistance and Deterrence" exhibition – is eloquent: he was not only a man of great projects, he was also a man of action.

At the Free French intelligence service, Pierre Guillaumat met André Pélabon – future Principal Private Secretary to Pierre Mendès-France – and Albert Buchalet, whom he recruited in 1955 as head of the *Bureau d'Études Générales* (BEG, General Studies Office). The BEG was the forerunner of the CEA's Direction des Applications Militaires (Military Applications Division), the entity in charge of designing and producing the nuclear weapons and of keeping them operational.

In January 1955, the tone of the memo setting up that new entity at the CEA was, to the say least, cryptic:

> "There is set up a General Design Office, at the disposal of the Chairman, for all design studies of an economic and financial nature relating to the use of atomic energy.
>
> That Office is administratively attached to the Chairman's Office.
>
> [Signed] Pierre Guillaumat"

It was therefore under the cloak of the most absolute secrecy that the BEG became operational, concealing the real objective of its mission and using a cover for acquiring some land in the Paris region, in Bruyères-le-Châtel, through the financial support of the *Service de Documentation Extérieure et de Contre-Espionnage* (SDECE), the forerunner of the current *Direction Générale de la Sécurité Extérieure* (DGSE, the Directorate-General for External Security), France's external intelligence agency.

In parallel, scientific backing for the initial work was brought by Yves Rocard, professor at France's prestigious *École Normale Supérieure* in Paris. He too was in the Resistance during the Second World War, working, in particular, on radar technology. Yves Rocard made all his knowledge and know-how available to the CEA soon after it was set up, in particular on the means for detecting nuclear testing around the world.

Appointed a member of the Atomic Energy Committee (*Comité de l'Energie Atomique*) in 1951, and then secretary and rapporteur of the Nuclear Explosives Committee (*Comité des Explosifs Nucléaires*) set up in 1954, Yves Rocard gave Pierre Guillaumat considerable scientific support for launching the French nuclear defence programme.

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I would now like to broach the role of another great figure of the CEA, who is probably less well known than Pierre Guillaumat, but whose action was essential, as already emphasised. That person is Raoul Dautry, who became the first chairman of the CEA, after having been appointed Minister for Reconstruction by General de Gaulle at the Liberation, and, prior to that, having been Minister for Armament from 1939-1940.

Very logically, and entirely consistently with the commitment from the atomic scientists of Free France during the war, Dautry considered that the renaissance of France – be it economic, political, or strategic – required work in the nuclear field to be resumed as rapidly as possible.

It was he who, with Frédéric Joliot, lay behind the creation, in record time, of the Atomic Energy Commission (*Commissariat à l'Energie Atomique*); we should remember that the CEA was the first civil body dedicated to nuclear energy to have been set up in the world.

When he signed the *Ordonnance* of 18 October 1945 setting up the CEA, General de Gaulle had already thought of everything because, as of Article 1, it was specified that the new public body would do scientific and technical research with a view to using atomic energy in various fields of science, industry, and national defence.

The work was indeed resumed rapidly because, as of 1948, the precursor work of the Joliot team on the uranium and heavy water sector led, on the French side, to divergence of the first experimental atomic pile known as "Zoé", installed in the Fort of Châtillon. Thanks to Zoé, the work started in 1939-1940 had been seen through to its conclusion by coming full circle.

Very quickly, the scientific governance of the CEA decided, not without some debate, to go down the road of using graphite as a moderator; the industrial developments in France were opening up some advantageous prospects in this field.

At the same time, it was decided by Antoine Pinay's government to programme this industrial effort in the form of a five-year atomic energy plan.

This programming was the work of Felix Gaillard, Secretary of State to the Prime Minister (*Secrétaire d'État à la Présidence du Conseil*), i.e. the key person in the government in charge of nuclear affairs. A member of the Resistance at the age of 20, Félix Gaillard was assistant to the Delegate-General of the French Resistance, Alexandre Parodi, before, at the Liberation, becoming Principal Private Secretary to Jean Monnet, the first *Commissaire Général au Plan* (Commissioner-General of the Planning Commission).

This idea of planning the economic and industrial effort was therefore at the core of the French nuclear programme from the outset, with the first five-year atomic energy plan being voted through parliament in 1952, launching the industrial phase of the programme.

With a budget of nearly 40 billion francs, that plan made provision for building two graphite atomic piles. The choice of the UNGG (*Uranium Naturel Graphite Gaz*) graphite-moderated gas-cooled reactor using natural uranium was then confirmed. This was how the first three reactors G1, G2, G3 (G being for graphite) came to be built on the Marcoule site. As of 1956, the G1 pile diverged, thereby producing 10 kilograms of plutonium per year.

Although at the time (in 1952), no political announcements were made about possible military applications, for the simple reason that it was too early to commit to national defence applications, it has to be admitted that the plan was going to enable France rapidly to have fissile materials in significant quantities.

In parallel, the people who had drawn up the plan had in mind to contribute to electrifying the country and that is why the G2 and G3 reactors were connected to the electricity grid from 1959-1960.

But, as we have already noted, the launch of the military programme came at the end of 1954. And, as of 20 May 1955, a decree established secretly the implementation of a "Plan to develop military applications for atomic energy", with funding of 100 billion francs, i.e. over twice the funding for the five-year atomic energy plan of 1952.

Issued while Edgar Faure was Prime Minister, this decree, which accompanied a memorandum of agreement between the French Armed Forces and the CEA, was the fruit of consultation between various Free France ministers; here too the networks of the Resistance had proved their worth in clandestine work serving the country. This idea of programming was taken up by General de Gaulle in 1960 to uphold the French defence effort, and firstly to put in place the deterrent force.

A sign of continuation of a political process started in the mid-1950 is that it was Félix Gaillard, who had become Prime Minister (*Président du Conseil*), who was to sign a secret decision in April 1958 setting the schedule for the first French nuclear experimentation for the first quarter of 1960, and that decision was to be ratified by General de Gaulle as soon as he returned to power. So here too, the process had been seen through to its conclusion by coming full circle.

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Naturally, I have only been able to cite but a few names of those who tied the Resistance in with the beginnings of the CEA, but there are many others.

The case of Jules Guéron, one of the very first to have joined Free France, on 25 June 1940, has already been mentioned; he played a considerable part in the beginnings of the CEA.

We could also have talked at length about the case of Robert Galley, who joined the Free French Forces as of 1 July 1940. When he joined the CEA fifteen years later, Robert Galley was put in charge of conducting the work on plutonium at the Marcoule site, and then on enriched uranium at the Pierrelatte site, before he became Minister for Nuclear Affairs, and then Minister for the Armed Forces on more than one occasion.

In conclusion, I would say that not only did the spirit of Resistance inspire the beginnings of the CEA, it still resonates in the minds of the French men and women who are today in charge of implementing nuclear deterrence on an everyday basis.

2.4. A look at the history of the French atomic weapon

Jean Guisnel[*]

I have worked on the history of the French atomic weapon and also on the contemporary period as a journalist. So, not as a scientist, or as a historian, but rather as someone trying to decode things for and enlighten my readers. I rapidly understood that the history of the French bomb was closely linked to the idea that General de Gaulle had of the state and of France with Free France, which he implemented from the outset of his resistance to the invasion. De Gaulle cared about the independence of France and about its autonomous capacity to prevent any further invasions. The revolution that began with the nuclear strikes against Japan led him to make setting up the French Atomic Energy Commission (CEA, *Commissariat à l'Energie Atomique*) one of his priorities. As soon as the war ended, he set it up.

On 12 October 1945, at a press conference, he pretended that such weapons were not for France, or at least that France was not directly interested in acquiring them. He declared: "As for the atom bomb, I am not convinced that we need to use it very quickly in this world. Anyway, the French Government is not losing sight of this issue, which is very serious for the whole world, and whose consequences are clearly huge. This bomb has cut the War short, for the moment, it has to be handed to it. But now we need to make sure it does not become a cataclysm".

We know that, after he left power the first time, the gestation of the nuclear weapon was taken over by the Fourth Republic. With twists and turns, episodes, highs and lows, but without ever failing, the radical governments, such as those of Pierre Mendès France and of Félix Gaillard, or the socialist governments like that of Guy Mollet, took up the baton over the next decade. The reins of the French team were handed to civilian leaders rather than military ones, who did not always see the point (that is an understatement).

As regards the key figure of Pierre Guillaumat, the reasons that he gave for his own interest in energy questions were to be found in the First World War. He was the son of General Louis Adolphe Guillaumat, Principal Private Secretary to the French Minister of War in 1914, and Commander in Chief of the Allied Army of the Orient in 1917. In 1918, Pierre Guillaumat was nine years old, and in 1926 his father Louis Adolphe became Minster of War in the Government of Aristide Briand.

But at the end of First World War, what did his father talk about? Oil. More precisely, the pleading that Georges Clemenceau had to do in 1918 to obtain American fuel to continue the war. The Peace Treaty of Brest-Litovsk had been signed on 3 March 1918 between Lenin and the Germans, and the Allies were going to have to face the troops who had hitherto been engaged on the Russian front.

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That was the moment that the powerful American company Standard Oil chose to interrupt deliveries of petrol to France. It considered that, after the collapse of the Ottoman Empire, the British, who had the oil resources of Mesopotamia – the future Iraq – at their disposal, were then responsible for refuelling the French. Pierre Guillaumat then understood – as he later explained – that a nation worth its salt should have its own energy resources. As a good *Polytechnique* graduate and engineer in the *Corps des Mines*, he made the solution to this complex energy problem the work of his life.

At the end of the Second World War, he was in North Africa in the intelligence services, and he became director of Fuels (*Directeur des Carburants* or "*DICA*" in French) as of the end of 1944. Everything remained to be done. France had no more access to oil than before the war, did not have any refineries, which were all destroyed, or even any oil tankers. As of the following year, Guillaumat presented to General de Gaulle a strategic plan aimed at putting an end to France's dependency on the major British-American oil monopolies. Such an approach could not but be well received by General de Gaulle, who adopted Guillaumat's proposals as his own. From this determination came the *Bureau de Recherche Pétrolière* (Oil Prospecting Office), set up in October 1945 and directed by Guillaumat until 1958.

For Guillaumat, the first part of his task had been accomplished. This engineer, and model of a French technocrat, was indeed a providential man because he had also thought of the atom, preparing France for having not only the atom bomb but also civil nuclear energy. While continuing the oil activities, he became, from 1951, boss of the CEA, and thus of the French nuclear sector. At his side, he began to form an all-powerful army of engineers, with one foot in defence and the other in industry, who were dubbed "*the nucleocrats*"; among them were André Giraud, Georges Besse, Michel Pecqueur and, later, Jean Syrota.

As of 1954, they won their first victory: Pierre Mendès France gave his approval for the creation of a nuclear explosives committee and of a research and design centre. It was thus Guillaumat who secretly steered the genesis of the French bomb, and organised the efforts under the Fourth Republic. Simultaneously, this man, who really was a key figure, presided over the destinies of EDF (France's electric utility) before becoming Minister for the Armed Forces (*Ministre des Armées*) in June 1958. But in reality he was appointed to that office for no other reason than for the bomb. He showed little interest in the other aspects of the job, despite being in the middle of the Algerian War, and he remained in that office until February 1960. He was then appointed Minister Delegate for Atomic Energy, Research, and the Civil Service (*Délégué Chargé de l'Énergie Atomique de la Recherche et de la Fonction Publique*) until 1962. We will forget here the cruel episode of the sniffer aircraft at the end of his career.

The year 1956 was a crucial one for the French bomb. It was the year of the Suez Crisis, which, among others, was a factor in triggering development of the bomb. In November 1956, France and the UK launched an adventurous military expedition for taking back control of the Suez Canal, which had been nationalised by Egyptian President Nasser. Moscow threatened to launch atomic rockets to drive them out. In reality, it was a barefaced bluff, and the economic pressures from Washington on London played a much more significant role in ensuring that

the French and British troops left without glory. At the end of the incident, numerous secret initiatives were launched. On 6 November, on the very day on which London and Paris decided to cut their losses, French Prime Minister Guy Mollet sent a secret proposal for military nuclear cooperation to the Germans.

On 30 November 1956, the decision was made to accelerate the nuclear programme, and, the following week, the Committee for Military Applications of Atomic Energy (*Comité des Applications Militaires de l'Energie Atomique*) was set up, without the decree setting it up ever being published in the French Official Journal (*Journal officiel*). After just one week, production was launched for the first strategic bomber and first French nuclear delivery system, the Mirage IV. The leaders of the Fourth Republic therefore took an unexpected decision shrouded in utmost secrecy, without ever ceasing to work on a specifically French bomb, and even going much further. As strange as it might seem, they seriously considered a European bomb with Germany and Italy, the former Axis powers, whose defeat was only eleven years old – all this after the European Defence Community project had aborted two years earlier.

We have mentioned Jacques Chaban-Delmas, a Gaullist through and through, who was then General de Gaulle's representative in the government, and Minister for the Armed Forces from November 1957 to May 1958, very much occupied with the Algerian War and above all with preparing for General de Gaulle's return to power after 13 May. He did not fail to show a very close interest in the nuclear weapon. As Minister for the Armed Forces, on 8 April 1958 he signed a deal with his German colleagues – Franz Josef Strauss, the "Bull of Bavaria" and the Italian Emilio Taviani – relating to co-funding the isotope separation plant of Pierrelatte: 45% each for France and Germany, and 10% for Italy.

The secrecy went as far as concealing that deal from the Americans. The French Ministry of Foreign Affairs wanted to inform Washington of the project, but Chaban-Delmas opposed that. Round-about routes were probably taken by various players so as not to keep Uncle Sam too much in the dark. As regards the seriousness of the French-German-Italian initiative, there is no doubt about it or about its purpose. The signatories went a long way, because the Pierrelatte plant started to produce at the beginning of 1965.

Chaban-Delmas had, since the Liberation, been looking with longing at the atomic weapon; the bomb was "his" bomb. I will quote from his book *Mémoires pour demain* (Memoirs for tomorrow), in which he explains: "My ministerial career under the Fourth Republic was guided throughout by my concern for keeping an eye on 'my' bomb. (…) Charles de Gaulle knew all that and approved, from the heights to which he confined himself". Thirty-five years later, I went to see Chaban specifically to talk about that European bomb. I asked him why he had pushed that French approach to the European bomb. He said: "Please excuse me, but I'm getting old, and I suffer from sudden memory losses. I can no longer remember anything". But he did smile a little and say: "You know, such things are very secret and should remain so". I considered that he had an excellent memory and that he did not want to talk about such matters.

In nuclear matters, we find ourselves at the core of the most absolute secrecy. It thus took nearly one quarter of a century for that tripartite deal to become known, through the work of the French Group of Researchers into the History of the Nuclear Weapon ("*Groupe d'Études Françaises d'Histoire de l'Armement Nucléaire*" or "GREFHAN"), directed by the eminent Professor Maurice Vaïsse. That work made it possible to uncover certain details: the general outline of the operation. Finally, only the Pierrelatte plant was to remain, because, as soon as he returned to power in 1958, General de Gaulle scrapped the project for the European bomb.

What remains today from this period that goes back over seven decades? When we look, we can quite easily find the main lines of the French nuclear military policy of today. It is rooted in that historic reality that has been dubbed "the nuclear monarchy", and, objectively, it has lasted since those years. The determination of industry and then of the military has never wavered down through all of those years. It has been placed at the core of the strategies of each of France's presidents, as from the first president of the Fifth Republic. For all of them, the atomic weapon has proved to be a focus of their policies. It remains the republican sceptre *par excellence*! The nuclear weapon is the illustration of the unique status of the head of state who embodies this nuclear monarchy. That expression was coined by a man whom we have just lost: Edmond Maire.

Since the first election of the head of state by universal suffrage in 1962, each of Charles de Gaulle's successors has understood that in his own way. Not everyone has found the magic formula that was used by François Mitterrand when he said: "The deterrent is me". Emmanuel Macron is seeking to get a message of that type across, but in a different form. On 4 July 2017 – and he was the first president to do it – he went and had his photo taken on the submarine *Le Terrible* while submerged. The aim was to modernise communications about his role with regard to the bomb. Naturally, he has not brought any conceptual breakthrough so far, but his five-year term has only just begun.

Another characteristic is that the head of state continues to decide alone in nuclear matters. There is no other authority to take the decisions. Admittedly the decisions are examined within the machinery of government in conjunction with industry, but the personal decisions of the head of state constitute long-term commitments and commit weapons in the long run. This is illustrated by the current president announcing very early, indeed during his election campaign, that he would maintain the two components (sea-launched and air-launched) of France's nuclear deterrent. He decides alone. It can be assumed, unless it changes but there is no reason for such change, that this policy will be France's policy for the next five years.

The bomb is always the subject of a consensus by default. Consensus is a word that is used often in this field. Together with some others, I share the opinion that this sort of "consensus" lacks soundness because there is no debate. Here, we are talking about the deterrent, its history, and its players, and unless I am mistaken, just about everyone knows one another. Few new faces are to be seen in this environment. Civil society is not interested in the debate. And yet it is not an intellectual question that is debated, and current events require us to discuss it, but no, it is a non-topic. The newspapers are not interested in it – I should know –

except for the North Korean missile launches, but once that has calmed down, we will say no more about it. There are few debates.

And yet the declarations by personalities who are eminent, such as Michel Rocard, Alain Juppé, Alain Richard, Paul Quilès or Hervé Morin, have not held any significant sway with public opinion. The discussion cannot get off the ground. The last constant I have identified, even though there are doubtless others, is that the constant budgetary efforts have not diminished. On the contrary, they are growing: sustaining, and therefore modernising, nuclear weapons are at the core of the budget increases announced for the coming five years. This has been confirmed by the Strategic Review (*La Revue Stratégique*) and by the Military Programming Act (*Loi de Programmation Militaire*) of 2019-2025.

One thing is sure: the increase in the budgets announced by France's president for his five-year term and a little beyond that is related, to a very large extent, to modernising the nuclear arsenal. Since the Resistance and then the Liberation, the intransigence, or indeed obsession, of the political and scientific, and then military, leaders has never wavered on the nuclear question, in the name of the last-resort guarantee of the security and sovereignty of France.

Chapter 3: General de Gaulle and Nuclear Sovereignty

3.1. General de Gaulle and nuclear sovereignty

Maurice Vaïsse[*]

The title "De Gaulle and nuclear sovereignty" is particularly well chosen. With de Gaulle, we have the convergence of a policy and a strategic environment. For de Gaulle, words had meaning, in particular the word "sovereignty". In his eyes, this legal notion had a political expression: national independence, a prerequisite for securing a standing on the international stage. The diplomatic expression of this is "the nation with free hands". In short, de Gaulle wanted France to do as it decided, refused to apologise for this, refused to be subjugated to an alliance and integrated within this alliance. This thus meant being uncompromising over national sovereignty.

For de Gaulle, once again, the experience of the war years was decisive. Military dependency gives rise to political dependency. He who does not have the means to fight must yield. To take Paris in August 1944 or to retain Strasbourg in December, a military force that was not governed by the decision-making of a foreign power was required.

When he returned to power on 1 June 1958, preparations for the first French nuclear explosion were well under way. De Gaulle endorsed in all respects the decisions taken by the previous governments, except on two issues: the tripartite cooperation projects with Germany and Italy, and assistance to Israel.

However, though I highlight the continuity between the Fourth Republic and the de Gaulle period, the nuclear adventure heralded a new era. Up until 1958, there was no question of acquiring an independent nuclear force to fulfil a national strategy, but to have the disposal of an asset that could be used at European Council and NATO summits. This was how it was envisaged by Félix Gaillard, Maurice Bourgès-Maunoury and Jacques Chaban-Delmas. From this point of view, there was a fundamental difference with Chaban, which de Gaulle made very clear to him subsequently.[430]

With de Gaulle, however, the atomic bomb became a priority instrument of France's general policy. A nuclear force is first and foremost a political tool, a means to an end, which is not so much about the security but the independence of France. From this point of view, I would like to emphasise the following, and this is why I felt the title *Nuclear sovereignty* was an excellent one: the backdrop to the late 1950s is, to my mind, essential if we are to understand de Gaulle's nuclear policy, which was informed by new strategic data, on the one hand, and the deep-seated convictions of the General on the other. At that time, there was constant talk on the Sputnik, space and disarmament issues, a moratorium on nuclear tests, which form the

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[430] See the testimonial of Jean Guisnel in this work.

backdrop to the international issues at play from 1956 to 1958. Moreover, we rarely point to the fact that the General's return to power coincided with the publication, in 1957, of Henry Kissinger's book *Nuclear Weapons and Foreign Policy*. There is no causal link between the two, but we can clearly see that this was the spirit of the times. The importance of this work is that it shows the deep-rooted significance of nuclear weapons in international relations and, in particular, the fact that nuclear weapons break up alliances and reconfigure the traditional balance of power. For de Gaulle, who was committed to an alignment of foreign and defence policies, which was not the case in the 1930s, it was obvious that the country had to have its own nuclear force. Due to their levelling effect, nuclear weapons allowed a medium-sized power like France the possibility of owning an absolutely essential tool.

I would like to mention a few milestones and a few cases where de Gaulle made this very clear.

He came to power on 1 June 1958. On 5 July, John Foster Dulles, US Secretary of State, arrived in Paris and de Gaulle said to him: "Everything is based around the nuclear force. You have this force [...]. We are well behind you [...]. But we are on the way to becoming a nuclear power. One thing is certain: we will have nuclear weapons". De Gaulle, however, did not reject the idea of the redistribution or the distribution of tasks within the Alliance, but, obviously, though he did not turn down US weapons, de Gaulle, like Félix Gaillard and the government of the Fourth Republic, wanted to control them and decide on their use. In that same conversation, de Gaulle recalled to Dulles that NATO would function more smoothly if France, the United States and the United Kingdom worked closely together to define an overall strategy.

On 5 July 1958, the future September 1958 memorandum was obviously in the General's mind. Everything is in the memorandum, which I will not elaborate on, as it is an extremely famous document. All of the developments of the 1960s were starting to take shape. There was clearly an attempt to develop tripartite relations.[431] There was a game of hide-and-seek between the Americans and the French. Both shared responsibility for this. The Americans explained that the McMahon Act clearly prevented them from acting. They also raised an important issue. They mentioned the "fourth country". The fourth country was the country that would have nuclear weapons. The fourth country haunted them because they feared it would be Germany. The French also bear responsibility: in particular, the famous nuclear sovereignty that they brought to the fore.

What are the stages in this development? On 25 May 1959, de Gaulle told Eisenhower in a letter that France would not store US nuclear weapons on its territory in US bases. This was related to the question of France continuing to store weapons, rockets, etc. In this letter, de Gaulle said that it was clearly not possible for France to place its existence in the hands of any other state whatsoever, no matter how friendly it might be. Eisenhower was extremely embarrassed because he understood de Gaulle and he even said, "To be honest, it has to be said, as regards to NATO, we would react in the same way as de Gaulle if we were in their

[431] See the contribution by Frédéric Gloriant in this work.

position". From time to time, you could hear Eisenhower cursing the McMahon Act, which was preventing him from doing as he wished.

There is an extraordinary scene in the memoirs of Vernon Walters, which recounts a meeting between de Gaulle and Eisenhower in Rambouillet after dinner on 3 September 1959. It is not in the verbatim report, or in the minutes or in the archives. Vernon Walters, who was there at the meeting, sometimes acting as interpreter, recounts the story. The two heads of states were sitting by the fire. In bathrobes. They were talking to each other like veteran soldiers. In fact, they were discussing this very issue. De Gaulle said: but why can't you let us share secrets? Eisenhower replied that he was sorry, he would very much like to, but it was out of his hands. In any case, we part, if I may say so, with a mutual understanding.

One of the milestones is, therefore, this letter from de Gaulle to Eisenhower. It is also, obviously, the nuclear test on 13 February 1960, where we see how extremely impatient General de Gaulle was for this test to take place, after being previously postponed twice. Finally, de Gaulle gave the order to launch unless the winds were too unfavourable. This is how impatient he was. Why? Because we were in an extremely intense period from a diplomatic viewpoint. There was the issue of a moratorium on nuclear testing and a summit conference in the pipeline. De Gaulle was eager to be able to sit down at the conference table knowing that France had the nuclear bomb. The same held for the H-bomb. He spent his time saying to Peyrefitte: "So, Peyrefitte, your H bomb?" Later came the rejection of the multilateral force, the refusal to sign up to the Treaty of Moscow, the withdrawal from NATO's integrated military structure and the rejection of the non-proliferation treaty.

From this point of view, since the issue of non-proliferation is an interesting question all the same, I would like to round off our examination of this question by looking at the attitude of de Gaulle towards non-proliferation through his theory of nuclear sovereignty. Indeed, the Americans urged de Gaulle to ensure that France, which had acquired nuclear weapons, did not pass them on to others. He was interviewed by Dean Rusk on 16 December 1964. At that time, there were still suspicions surrounding relations between France and Israel despite the instructions issued by de Gaulle in June 1958. De Gaulle replied categorically that he was not in favour of proliferation: we will not supply others with the bomb. It is the other aspect that I feel is extremely interesting: de Gaulle showed himself to be both fatalistic and sceptical towards the issue of proliferation and, at the same time, visionary. He said that the only way of preventing proliferation would be to abolish nuclear weapons universally. Unfortunately or fortunately, he said, this will not happen. And he went on to say: "The Bomb is becoming easier and easier to make, we won't be able to prevent India, Japan, Sweden from doing so, this may well be a global fact that we will be powerless to stop until the next war. We could of course envisage theoretical measures. A Council – the Council of Lateran – banned the crossbow, but to no avail".

De Gaulle's conception of dissemination, proliferation and issues of nuclear sovereignty gives food for thought. Deep down, de Gaulle had little appetite for strategic analyses and issues regarding the doctrine.[432]

To Raymond Aron, who had sent him a copy of his book *Le Grand Débat*, he responded with thanks and congratulated him on this analysis, adding that "there would always be theologians – follow my gaze – and emphasising the fact that, for him, the main question was: will France remain France?"

[432] For further reading, see: Maurice Vaïsse, *Diplomatie et outil militaire, 1871-2015* (with the help of Jean Doise for the period 1871-1918), Éditions du Seuil, 2015, and Maurice Vaïsse, *La Grandeur. Politique étrangère du général de Gaulle*, Fayard, 1998, CNRS Éditions, 2014.

3.2. The foundations of the nuclear deterrent established by de Gaulle: modernity and independence

Jacques Godfrain[*]

The nuclear deterrent is the common thread and the cornerstone of General de Gaulle's policy of independence, which links defence and foreign policy.

I would like to make two sets of comments related to the General's relationship to the deterrent.

The first relates to the continuity between the efforts made by de Gaulle to modernise the French Army during the 1930s, which led him to identify the need for modernity and sovereignty, and the momentum created by the Liberation, which was to lead him to become the founder of the *Commissariat à l'énergie atomique* (French Atomic Energy Commission) (CEA). This strong tendency in de Gaulle's thinking stems from his long-standing faith in technical progress, which is also a deep-rooted trend in our country, which was, in 1936, the first of the major industrial powers to create a Ministry of Research.

The creation of CEA, which de Gaulle enacted through the decree of 18 October 1945, was, as pointed out by Bertrand Goldschmidt, the last decree that he signed before the expiry of the period during which he could legislate solely with the consent of the *Conseil d'État*: how better to demonstrate the importance that the General attached to this issue? The start of the nuclear adventure had got under way without France, and de Gaulle, who was kept in the dark by the Allies, owed what little knowledge he had of the topic to a handful of French scholars involved in this adventure, and had, in mid-1944, broken their confidentiality commitment within the discreet setting of the delegation of the *France Combattante* of Ottawa: Pierre Auger and Jules Guéron had sketched out "the apocalyptic work" in the offing after escaping the attention of the American services for a couple of minutes. It was also subsequent to this contact that de Gaulle hastened to launch this research in France, for example by calling on the services of Frédéric Joliot-Curie, who had remained in France during the Occupation and had been a member of the Communist Party since 1942.

In 1940, French research had made significant progress in the field of nuclear fission, and the surreal episode of the embarkation of the heavy water reserves heading for England by Halban and Kowarski on 18 June 1940, as well as Joliot-Curie's refusal to leave France for London, probably put the brakes on this promising momentum. The work of the Maud Committee in the UK, which was directly based on the French research and contributions of our scientists, was key to the US decision to embark upon a large-scale nuclear programme in late 1941. But, as attested by Bertrand Goldschmidt, the United States was very reluctant to let French scientists work on their nuclear programme: the US theory of nuclear non-proliferation was already under way, and was reflected on the ground by the exclusion of our scientists. It was

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only the creation of the science office of the Free France delegation in New York that, despite a few ups and downs, enabled this obstacle to be surmounted, and several episodes in the wake of the Quebec Agreement, including the famous meeting between Halban and Joliot-Curie in Paris in December 1944, showed the very strong reluctance of the US to let France make progress in this field. It should be noted that, in this field, Churchill in no way interceded in our favour in his relations with the Americans, while the figure of Joliot-Curie was portrayed as the spectre of Franco-Soviet collaboration.

The reality of this possibility, in a France that was just starting to rebuild, was far more modest. It was only on 13 March 1945 that a memo by Raoul Dautry raised the possibility of resuming French research in this area by once again purchasing heavy water from Norway. De Gaulle had met Joliot-Curie in late 1944, and did not hesitate in appointing a man who had joined the Communist Party as head of CNRS. In the end, the two bombings of Hiroshima and Nagasaki precipitated a process that had been deemed too progressive up until then: in late September 1945, de Gaulle charged Frédéric Joliot-Curie and Raoul Dautry with the task of setting up a structure dedicated to nuclear research, which was initially placed under a dual scientific and administrative authority, reporting directly to the head of government, and had substantial financial and administrative autonomy. Despite the precipitated nature of the creation of CEA (less than one month between the decision taken at the end of September and the Decree on 18 October), de Gaulle had from the outset taken bold decisions allowing CEA to get off to a quick start, in particular thanks to all the knowledge collected indirectly during the war.

My second set of comments relates to the General's conception of the deterrent. The nuclear doctrine enacted and implemented by de Gaulle arose from several new developments on the international stage, nuclear parity being the main one. Even though it was not completely operational in 1958, the Warsaw Pact could boast the capacity to strike US territory: the United States was thus no longer a lone country able to use its nuclear threat without itself being threatened in return. All of this called into question the military strategy of NATO and the defence of Europe. From then on, it was inconceivable for the US to start a widespread conflict in response to a local conflict in Europe, which the US had fully understood as early as 1962. Hence the development of the flexible response. Henceforth, it would be the responsibility – the sole responsibility – of the US to assess the level of response to be used in the event of an attack by the Soviets.

This transition to the tactical use of nuclear weapons was to force European countries to redefine their own security strategy. Indeed, the US "roll-back" gave rise to a continuous inflation of conventional forces in Europe, and to the development of tactical nuclear weapons. However, as early as 1964, General Ailleret, in a paper, showed that, in the event of a Soviet offensive, Europe would be the battlefield for these conventional forces and that an increased use of tactical nuclear forces would be probable; the consequences for the German, French and Dutch populations would be devastating.

Within this changing context, de Gaulle's new definition, which led to pointing to the need for "a strike force able to deploy at any time and anywhere", is indeed based on a clear-headed

analysis of this development. The principles were presented at the *Ecole Militaire* (Military School) on 3 November 1959: "The defence of France must be French; if a nation such as France must go to war, that war must be France's war.". What is said next is essential: "This implies, of course, that we must be able to arm ourselves, over the coming years, with a force that can take action on our own account, what is commonly known as 'a strike force' that can be deployed anywhere, at any time. It goes without saying that this force will be built on an atomic weapon, which must belong to us. And since France could possibly be destroyed from anywhere on earth, our forces must be able to act anywhere on earth". Everything is said in just a few words: the French strike force must be autonomous and must be able to strike immediately and permanently in order to guarantee France's full independence.

This was a complete reappraisal, which *de facto* excluded France from the flexible response that was so dear to the Americans, and was diametrically opposed to their non-proliferation strategy, which would have left them as the sole defender of the Western world with nuclear weapons. As early as 1962, the United States, under the leadership of Kennedy, shaken by the initiative and transgression of de Gaulle, was forced to reverse its position, for example by offering the UK a nuclear submarine force equipped with the Polaris missile. But the strategy of de Gaulle was a holistic strategy, which was designed to guarantee territorial security, as well as to give back to our country the ability to take foreign policy initiatives. Though it did not make France a third great power, the nuclear deterrent allowed it to free itself from the restrictive straitjacket of the Cold War. De Gaulle was in fact going to further explain this doctrine at his press conference on 23 July 1964:

> "The path of deterrence is now open to us. Because attacking France would mean terrible destruction for the attacker, whoever it may be. The megatonnes that we could launch would probably not equal in number those that the Americans and the Russians are able to unleash. But as of a certain nuclear capability, and as regards the direct defence of each and every one of us, the proportion of the respective means no longer has any absolute value. Indeed, since a man and a country can only die once, a deterrent exists as soon as you have the means to fatally injure any potential attacker, are very determined and the adversary is also convinced of this."

Everything is linked in de Gaulle's doctrine: the desire for strategic independence at a time when the United States was no longer prepared to unconditionally protect Europe with its nuclear umbrella, the modernisation and research work, which had been since the 1930s for de Gaulle the key to sovereignty, the possibility to derive from this sovereignty a capacity for initiative in Europe and globally, as France was no longer in a position of "strategic and, therefore, political dependence", according to the words of the General.

France had thus ceased to be a pawn on the global chessboard, and was taking on a specific, special dimension, which had no real equivalent, and which provided the country with a new capacity for initiative. De Gaulle drew the cold, hard lessons of this, detailing the "strategic and, therefore, political dependence" that the countries that had no atomic weapons endured – or thought they endured – in respect of the Big Two.

My final comment would be on the French doctrine applied to any attack against the "major interests" of France. De Gaulle's doctrine was designed to create uncertainty, and was not necessarily to be restricted to defence of the national territory. The development, in the 1960s, of a submarine fleet and the Mirage programme, followed by the creation of the Plateau d'Albion, were designed to pose a nuclear threat, and to complete the 1959 doctrine, through a force capable of deploying "at any time and anywhere", in short an "all-azimuths" force, to quote the expression used by General Ailleret.

I would like to conclude by emphasising that this doctrine contributed to the national DNA bequeathed by General de Gaulle. Even though the policy of deterrence developed in the 1960s was contested, as it was deemed disproportionate or too costly for our country by those who had thought its decline as inevitable, no head of state has challenged either the principles or the application of this doctrine. Through the implementation of certain principles, it probably constitutes the alignment of defence and foreign policy, the firm commitment to modernity in the interests of independence, a shining illustration of the lessons learnt by General de Gaulle throughout the 1930s in order to guarantee the deep-rooted objective of any supporter of de Gaulle: that France would never again suffer the demise of 1940.

3.3. Diplomatic battles over deterrence

Benoît d'Aboville[*]

Between 1954 and 1974, France's efforts to acquire a national deterrent were to be strongly opposed by our allies, particularly the United States.[433] French diplomats, along with politicians and the members of the *Commissariat à l'énergie atomique* (French Alternative Energies and Atomic Energy Commission) (CEA), were at the centre of the debates. At the end of the day, despite initial divergences, a consensus developed on the issue of an independent strike force, the decision not to integrate the military structure of the North Atlantic Treaty Organisation (NATO) and the rejection of the flexible response strategy.

This twenty-year period, which was littered with controversies, marks to a certain extent the first cycle in the "French nuclear adventure", to use the expression of Bertrand Goldschmidt, who was in charge of international relations at CEA. On 26 December 1954, Pierre Mendès France convened the main protagonists of the French nuclear programme to a meeting at the Ministry of Foreign Affairs. Even though he defended his actions subsequently, this meeting marked the start of the government's commitment to the nuclear military option. In 1974, at the meeting of the North Atlantic Council in Ottawa marking the 25th anniversary of the Alliance, the allies acknowledged the specific role played by the French and British nuclear forces as a deterrent. Opposition to the very principle of an independent nuclear force had finally given way to its acceptance.

The contribution of scientists, engineers, technicians and industrialists to developing the deterrent is well documented.[434] The same cannot always be said of the role of diplomats, if only due to the difficulties accessing archives. Initially, not all of them were favourable to the military nuclear programme, to say the least, as they feared, and some were even affected by, the difficulties this caused with the United States and our partners in the Alliance.

The failure of the European Defence Community (EDC) and, later, the French withdrawal from NATO, hurt some diplomats. However, from 1962, and even though General de Gaulle's style was often irritating to some, a progressive consensus developed around the need to resist the various attempts of our partners to replace the French deterrent within the framework of NATO and/or the Multilateral Force (MLF).[435] The temptation to facilitate the French

[*] Former ambassador, vice-president of FRS.

[433] See a large number of works published in French, including Maurice Vaïsse, Frédéric Bozo, Pierre Melandri, *La France et l'OTAN 1949-1996*, proceedings of the colloquium of the CEHD held at the Military School (Paris), 8-10 February 1996, Éditions Complexe, 1996 ; Frédéric Bozo, *Deux stratégies pour l'Europe. De Gaulle, les États-Unis et l'Alliance Atlantique 1958-1969*, éd. Pion, 1996 ; George Henri Soutou, *L'Alliance Incertaine, les rapports politico-stratégiques allemands, 1954-1996*, Fayard, 1996 ; Institut Charles de Gaulle, *L'Aventure de la Bombe, De Gaulle et la dissuasion*, éd. Plon, 1985 ; Pierre Melandri, *Une incertaine Alliance*, Publications de la Sorbonne, 1988.

[434] See, for example, the various works and publications by Dominique Mongin.

[435] See the contribution by Frédéric Gloriant in this work.

programme and to reduce costs through the use of poorly defined US aid was great, but this option met with resistance that eventually won the day.

3.3.1. The premises of the debate

The hesitations of a section of the political class under the Fourth Republic in respect of the military nuclear option and the divisions that the EDC issue was to cause, initially made the definition of a clear diplomatic line difficult and created tension with the Ministry of Foreign Affairs. It is true that, as early as 1945, the implications of the militarisation of atomic energy had been identified by French diplomats. But it was the United Nations framework, where France had just taken up its seat at the Security Council, that continued to be the preferred forum for managing this transformation of the international order. Thus, Jean-Daniel Jurgensen, a member of the French Resistance and diplomat,[436] wrote, on 9 August 1945 in *France Soir*, "humanity has entered a new era in its development […] it is now really faced with an alternative: between organising peace or risking extinction". Posted to Japan, Francis Lacoste, during a visit in January 1946 to Hiroshima with the *Commission Consultative pour l'Extrême Orient* (Consultative Committee for the Far East), described to the authorities in Paris the damage wreaked: "A great deal of time will be required to heal this awful moral wound that has blighted Japan and, in a more deep-rooted way, the whole of the community of nations".[437].

The prevailing feeling at the time was the one expressed in the Lilienthal-Acheson report: the impossibility now of "uninventing" the atomic bomb, the need to seek international control through the United Nations, recognition of the importance of peaceful applications of atomic energy. French diplomacy at the time went along that line, which was advocated by Fréderic Joliot-Curie, who was still the head of CEA prior to his eviction for political reasons. In June 1946, at his insistence, Ambassador Alexandre Parodi[438] declared before the Atomic Energy Commission, which had recently been created by the General Assembly of the United Nations (it was the subject of the first resolution adopted by the UN): "I am authorised to say that the goals set by the French government in respect of the research of its scientists and technicians

[436] A graduate of the *Ecole Normale Supérieure*, Jean-Daniel Jurgensen entered the Resistance movement in autumn 1940. He joined the *Défense de la France* movement in spring 1942 and published many articles in the underground newspaper of the same name. He contributed to changing the direction of the movement towards Gaullism and became a member of the steering committee of the National Liberation Movement (MLN). Designated as a member of the MLN to the provisional consultative assembly in 1944, then as a member of the first constituent assembly under the UDSR banner (1945-1946), he subsequently resumed his career as a diplomat. He was a member of the French delegation to the UN (1947-1951), head of the German Affairs Department (1955-1959), deputy permanent representative to NATO (1959-1964), America director (1964-1969), ambassador to India, then to the Netherlands.

[437] Archives of the Ministry of Europe and Foreign Affairs, AMEAE, 37200/630, p. 36-37.

[438] After being relieved of his duties by the Vichy Regime, Alexandre Parodi entered the Resistance movement and became the delegate general to the *Comité français de la Libération nationale* (French Committee for National Liberation) (CFLN) in 1944, before joining the interim government as Minister for Labour. First Representative of France to the UN, Secretary General of the Ministry of Foreign Affairs (1949-1953), then ambassador to NATO (1955-1957) and to Morocco (1957-1960). He became vice-president of the *Conseil d'Etat* from 1960 to 1971.

are entirely peaceful ones...” However, by 1948, following the failure of the Baruch plan[439] and the rise of the Cold War, it had become clear that the UN approach had lost all credibility. However, it was to continue to appear for a long time, just like a mantra, in French discourse on disarmament, such as during Pierre Mendès France’s trip to New York in 1954[440] or that of Edgar Faure[441] in 1955. It was to remain a leitmotiv for nuclear opponents in France through to the 1970s, before being resuscitated in recent times by non-governmental organisations (NGOs).

With the onset of the Korean War in June 1950, during which the option of tactical use of nuclear weapons was discussed, the widespread surprise at the progress made by the Soviets and the hardening of Soviet-US enmity, the context of the debate was to be profoundly changed. The United States adopted the doctrine of massive retaliation and, to strengthen the Alliance, requested that the Europeans authorise the rearmament of West Germany. The French diplomatic service tried to find a way out. In October 1950, the French proposal to set up the European Defence Community, which was designed to be a response to the pressure of Dulles, was an attempt to reconcile the irreconcilable while the affair tore politicians and public opinions apart.

For the advocates of the French nuclear option, it also constituted a first warning: in July 1954, Senator Michel Debré[442] denounced the prospect of subordination as a result of the transition from the nuclear option to an allied veto. The battle for ratification of the EDC project and its failure on 30 August 1954 not only destabilised the political balance within the Fourth Republic, but also publicly raised the question of the military nuclear option. It also caused deep divisions within the Ministry of Foreign Affairs; there were still many in favour of giving priority to the European process, the price of which would be to acknowledge equality of rights with Germany, which was consubstantial with the federal approach advocated by politicians at that time.

The London Agreement and the creation of the Western European Union (WEU) were to raise the issue of the status of the military nuclear capability of the UK, which conducted a nuclear test in 1952, and its positioning regarding France and Germany. In light of the expected development of nuclear energy for civilian purposes, the negotiators of the new European treaties considered that it should be subsumed in the European process in the same way as

[439] The Baruch plan, which was submitted to the United Nations Atomic Energy Commission, provided for international scientific cooperation on atomic energy use for peaceful purposes, elimination of nuclear arsenals, and establishing means for ensuring compliance with the treaty. This plan was rejected by the Soviet Union.

[440] Pierre Mendès France entered the Resistance after escaping from jail during the Vichy Regime. He then joined the *France Libre (Free France)* Air Force in the UK. General de Gaulle appointed him to the CFLN, then to the Interim Government of the French Republic. He was Head of the Government (1954-1955) at the time of the Tunisia and Morocco affairs and the failure of the EDC.

[441] Edgar Faure testified in favour of Pierre Mendès France during his trial by the Vichy Regime. He went into exile in North Africa and joined the Interim Government of the French Republic. He was appointed twice as prime minister and elected president of the National Assembly.

[442] Michel Debré entered the Resistance in 1943, joining the *Ceux de la Résistance* (CDLR) network; after the Liberation, he became commissioner of the Republic in Angers. He was then appointed by General de Gaulle to reform the civil service. As a senator, then prime minister and defence minister, he was a strong advocate of a military nuclear programme.

the European Coal and Steel Community (ECSC), and that its uses should be both limited and controlled by the Community (the issue was to be raised again with Euratom). For France and its military ambitions, the issue revolved around European control of fissile materials and uranium stocks, as well as their exclusive use for civilian purposes, given the distinctive status of Germany and Italy.

According to the formula, sometimes ascribed to Alexandre Parodi, sometimes Jean-Marie Soutou, French politicians were, in the wake of the EDC, once again to take an impossible gamble: "We first tie up Germany, then we tie ourselves up in the name of equal rights, then we rack our brains to try to untie ourselves". The debate was not just being held within Europe. It was being followed very closely by the Americans, who supported the creation of Euratom, via the *Comité d'action pour les États-Unis d'Europe* (Action Committee for the United States of Europe), which was chaired by Jean Monnet.[443] Retrospectively, the limitations foreseen in the draft Euratom treaty tend to substantiate the interpretation of Bertrand Goldschmidt, according to which the encouragements from the United States to create "a European non-proliferation zone", which was to be a natural obstacle to France's military projects, were a prelude to the non-proliferation policies of the 1970s and 1980s.[444]

In the end, France obtained the desired exemption from the control of its fissile materials for military purposes thanks to the derogations for the French programme agreed to by Chancellor Adenauer. Germany was in fact involved at the same time in a trilateral nuclear cooperation project between France, Germany and Italy, which has been studied in detail by Georges Henri Soutou.[445] The Suez Crisis and, at the same time, the events in Hungary, cast doubt on the US involvement alongside its European allies. As a result of the lessons learnt from the crisis, the French stepped up their national programme. The Germans, for their part, were focused on defending Berlin and the influence they could bring to bear on the US via its cooperation with France. It was against this backdrop that various tripartite agreements were concluded by Defence Ministers Jacques Chaban-Delmas, Franz Josef Strauss and Paolo Emilio Taviani in 1956 and 1957. The agreements covered joint research, financial participation in the construction of the Pierrelatte enrichment plant and, in square brackets, potential participation in weapons manufacturing (which would not be stationed in the Federal Republic of Germany in order not to breach the latter's commitments).

The German objectives in this negotiation, in which the Federal Defence Minister Franz Josef Strauss played a central role, were debated: obtaining equal status with France, subsequent

[443] Jean Monnet, a businessman and financier, was appointed at the start of the Second World War as president of the *Comité de coordination économique franco-britannique* (French-British Economic Coordination Committee) before becoming one of those working on the project for a Franco-British Union. Committed to closer relations with the United States, he also took part in setting up the French Committee for National Liberation. He played a major role in the European initiatives in which the Fourth Republic was involved. He participated actively in setting up the Marshall Plan as Commissioner-General of the French National Planning Board and was one of the founding fathers of the ECSC and the EEC. A proponent of a Euro-Atlantic approach, founder of the *Comité d'action pour des États-Unis d'Europe* (Action Committee for the United States of Europe), he was to become a fierce opponent of the foreign policy of General de Gaulle.

[444] Bertrand Goldschmidt, *Le complexe atomique. Histoire politique de l'énergie nucléaire,* Fayard, 1980.

[445] Georges Henri Soutou, "The 1957 and 1958 agreements: towards a strategic nuclear community between France, Germany and Italy?", *Matériaux pour l'histoire de notre temps*, no.31, 1993 ; et *L'Alliance incertaine*, Fayard 1996 p. 97-121.

access to its own programme,[446] encouraging the US to potentially amend its McMahon Act, the rules of which Eisenhower suggested could be made less stringent, and, above all, influencing the new US strategic orientations. The latter were indeed starting to move away from "massive retaliation" and provided for the deployment of Thor and Jupiter medium-range missiles in Europe. General Norstadt, the NATO Supreme Allied Commander Europe (SACEUR), even envisaged making the Alliance a "fourth nuclear power" thanks to the stationing of these missiles. Their control was not explicitly specified despite the efforts made, in particular, by François de Rose,[447] deputy of General Puget at the Secretariat-General for National Defence, to look into the real intentions of the United States. But the SACEUR was recalled to Washington, because he was deemed to have been imprudent in his dealings with handling of the allies. Moreover, he disagreed with the initial prevailing thinking in the United States on the issue of the "flexible response". For him, he said to a French counterpart in July 1962, "the planners in the Defence Department are wrong if they think that they can break a war down into different phases separated by thresholds. It may happen that way, but the opposite is probable. As for the objective of the 30 divisions listed in the MC 26/4, this should not be set in stone. Any idea of conducting a war in Europe using conventional means only is not realistic unless we envisage having 60 to 90 divisions on D Day, which is clearly not feasible".[448]

However, this was exactly what the new Defence Secretary McNamara was to propose in 1963, and which was opposed by France. Civilian and military cooperation between France, Germany and Italy was thus to be advocated by Jacques Chaban Delmas and the Ministry of Defence. When informed, the politicians (Maurice Faure,[449] Christian Pineau[450] and the head of the government, Félix Gaillard[451]) had reservations about negotiations from which the Foreign Affairs Ministry was excluded. At a meeting at the US Embassy on 1 February 1958,

[446] See George Henri Soutou, *ibid*. George Henri Soutou considered that, for Franz Joseph Strauss, this was at least an implicit objective, as the French priority was the financing of enrichment and Adenauer keeping his options open.

[447] After serving as a liaison officer with the British High Command following the Allied landing in North Africa in November 1942, François de Rose became a French diplomat and, in 1946, took up a seat at the United Nations Atomic Energy Commission before sitting on CEA's *Comité de l'énergie atomique* (French Alternative Energies and Atomic Energy Commission) in 1951, where he was for a long time the representative of the French Ministry of Foreign Affairs. Deputy Chief of the General Staff of the National Defence in the early 1960s, he was later appointed as France's permanent representative to NATO, where he played a decisive role in drafting the Ottawa Declaration (1974). He is also the author of many works.

[448] Memo of the National Defence staff (private archive).

[449] Maurice Faure entered the French Resistance after the Allied landings in June 1944, joining the Corps franc Pommiès. After the war, he became a prominent figure in the pro-European movements and was to be one of the negociators of the Treaty of Rome on the EEC.

[450] A Signatory of the *Manifeste des douze* (Manifesto of the Twelve) in 1940, Christian Pineau was one of the founders of the *Libération Nord* movement and distributed an underground bulletin called *Libération*. In 1943, he advocated the reunification of the Resistance movements, which was to take the form of the *Conseil national de la Résistance* (National Resistance Council). In May 1943, he was arrested by the Gestapo and deported to Buchenwald. After the Liberation, he joined the Interim Government of the French Republic (GPRF).

[451] Félix Gaillard joined the Resistance and became the deputy to Alexandre Parodi, who was the Delegate-General of the Resistance. After the Liberation, he became director of the cabinet of Jean Monnet, Commissioner-General of the French National Planning Board. As tax inspector, he became a member of parliament in 1948 and a member of the government at the age of 28. Thanks to his participation in several governments under the Fourth Republic, he played a decisive part in launching and developing France's military nuclear programme.

Jean Laloy,[452] who was then Europe director at the Ministry of Foreign Affairs and one of the most influential diplomats of his time, expressed his concern in confidence to his counterpart.

According to a now declassified "top secret" telegram from the State Department, Laloy confessed that "at the Ministry, there was a great concern about the possibility of seeing West Germany gain access to its own nuclear capacity through its participation in the French programme". He added that this position "was not shared by Chaban-Delmas and others in the Defence Ministry". He thought that "Strauss and a few German military staff were pushing in this direction and that it was expected that the Chancellor would oppose it but his days were numbered". In Paris, "they did not like the idea of helping a West Germany that was still divided and, consequently, subject to specific pressures, to obtain a nuclear weapon for itself, while the stabilising influence of the Chancellor would disappear within a few years". The telegram added: "Laloy did not question the determination of France to run at least a limited nuclear programme. He had previously been opposed to the programme, but came round to thinking that this was key to giving the French the feeling that they were on an equal footing with the United States and Great Britain. Without an atomic bomb, France would be a much more difficult ally for the United States than if it had a few such weapons of its own".[453]

These words reflected a widespread feeling at the time in French diplomatic and political circles: to solicit aid from the Americans in the hope that the McMahon Act would be toned down rather than to bring the Germans closer to obtaining nuclear weapons. This argumentation was to be constantly used and reused by French diplomats until 1962: the interest for the Americans themselves in helping the French programme, the unacceptable nature of the different nuclear status of France and the UK, the sensitivity of the German question due to the fragility of the situation in Berlin and the division within the country, which was likely to be used as leverage by Moscow. Raymond Aron echoed a widespread opinion in *Le Figaro* newspaper of 21 November 1960: "It has to be demonstrated that we are not sacrificing European and Atlantic coherence, which guarantees our security, under the illusion of military independence, which is currently inaccessible". Nevertheless, the American obstruction had been underestimated in Paris.

3.3.2. Misunderstandings and break-up

As soon as he came to power, General de Gaulle reasserted his determination to pull out of Algeria (but he obtained permission to use the nuclear test centre in Hoggar for a period of five years after independence), to secure a new distribution of powers within an Atlantic Alliance overhauled to the advantage of the three main Western powers (the 1958

[452] Member of a Resistance network in the Jura region, and of the delegation of the Interim Government of the French Republic (GPRF) in Switzerland during the war, and specialist in Soviet affairs, Jean Laloy was to be the interpreter of General de Gaulle at his meeting with Stalin in 1944. As Europe director at the Ministry of Foreign Affairs (1956-1961), then political director (1961-1964), Jean Laloy exerted decisive influence during the Fourth Republic over German affairs and East-West relations. He was close to Raymond Aron and was part of a generation of diplomats and researchers on security issues.

[453] Archives of the State Department, NND 887426, 01/02/1958.

"*memorandum*") and to speed up the national nuclear programme already commenced under the Fourth Republic. For him, the three ambitions were linked.

In the nuclear field, he did not, *a priori*, at least initially, rule out technological and scientific aid from the Americans. The British, who were monitoring the rapprochement between France and Germany, emphasised as early as November 1958, during Macmillan's visit to de Gaulle, that nuclear aid for France could only come from the United States due to the provisions of the McMahon Act. Macmillan explained to de Gaulle, according to the memoirs of Ambassador Chauvel,[454] that "the huge cost of atomic development is so high that the British government intends to maintain only a small capability designed to back up its diplomacy and that, for the rest, it would accept what Washington offers it and which would be under dual control". De Gaulle is said to have replied during that meeting that "if Washington supplied it with a share that was placed under the exclusive control of France, the rest being placed under dual control, he would go along with it".

Another testimonial runs along the same lines and emphasises the persistent conditionality of the US approach. President Kennedy was received at the Élysée in June 1961 on his way to Vienna, where he was to meet Khrushchev for the first time. Above and beyond the German question, the US delegation interpreted the words of General de Gaulle on the nuclear issue as a call for bilateral nuclear cooperation.

The meeting mentioned by Paul Nitze,[455] then Assistant Secretary for Defense, focused initially on Berlin and the *Western Executive* project proposed on 14 September 1958, but the US delegation "realised quickly that it is not the envisaged consultations between Dean Rusk and Couve de Murville that are of interest to the General […] What de Gaulle wanted in fact was assistance from the United States to develop his own nuclear capability". At the request of President Kennedy, the Assistant Secretary for Defence developed a proposal "designed to test the French in order to determine if they were ready to join the NATO military structure. Assistance could be provided if French capabilities were not only allocated to NATO, but also placed under NATO command. It is true that there was a risk that the French, having obtained what they wanted, would then renege on their commitments". But, said Nitze, "even if the French were to leave the agreement, it would perhaps have the advantage of prompting them into greater cooperation with NATO". In any case, he added, "they will secure a nuclear capability through their own means". Nitze was of the opinion that subsequent events had shown that he had been right, but his ideas had been firmly opposed by the State Department for two reasons, he explained: "National nuclear capabilities were not in the interests of the United States and no one could guarantee that France would not subsequently renege on its obligations to NATO, and this approach ran counter to the multilateral force project, which, for George Ball and Robert Schaetzel, would provide a solution to the European strategic

[454] Jean Chauvel, *Commentaire* vol. III, Fayard, 1973, p. 276. Jean Chauvel, a diplomat who rallied to General de Gaulle, joined the interim government in Algiers in1944. A disagreement between him and de Gaulle caused him to leave the political arena, but he later returned between 1946 and 1949. As French ambassador to the UK (1955-1962), he had to deal with the Suez Crisis, the regime change in France and the Algerian war.

[455] State Department Archives. Nitze Fund.

problem and to that of the unification of Europe". He added, however, that President Kennedy did not share the "fanaticism" of the advocates of the MLF.

President Kennedy explained his position to General de Gaulle in a fairly blunt manner in a letter addressed to him on 30 December 1961. He indicated that, as well as proposing possibly sending out diplomatic feelers to Moscow on the issue of Berlin, he intended to adopt a moratorium on atmospheric nuclear testing – which could only be negatively interpreted in Paris. He highlighted that it was first necessary with France to broach, "in a frank manner", the differences of opinion on the nuclear issue:

> "We have shown continued commitment to the defence of Europe and we cannot believe that a French nuclear force could contribute to it. Your country will have to make significant efforts in this area. I wonder whether, within a larger framework, it might not be possible to give you support by securing for you the sort of protection that France requires and must receive in the years ahead. What bothers us about a specifically French nuclear capability is that we would have very few arguments to oppose an inevitable significant pressure from Germany to obtain the same treatment. Moreover, from the technical viewpoint, we have serious doubts that a really effective deterrent could be developed, even by nations as strong and advanced as France. We believe that more space and resources will be needed to develop systems able to avert the threat of blackmail, particularly if we take account of new, highly sophisticated systems. This could be particularly true if progress is made in the antimissile field. We have the same doubts in respect of Great Britain. We have cooperated with them since the start of the Second World War and now we cannot put an end to a relationship based on mutual trust. But we do not believe that, as the nuclear age progresses, Great Britain will be in a position to maintain an effective national deterrent all alone. I hope that this opinion is also shared by our British friends. If Great Britain were in France's position today and if we did not already have agreements on the exchange of information, I can assure you that our attitude towards it would not be different from the one we have towards France at present."[456]

Moreover, he acknowledged that, "as the intercontinental capabilities of the USSR develop, European countries will feel the need to develop a nuclear protection capability that addresses clearly and specifically any attack in Europe".

At the Ministry of Foreign Affairs and at the national defence staff, the following was noted: the insistence on the difference between the French and British situations, the assimilation of France and Germany and, particularly, the doubts expressed about the ability of France to achieve a sufficient level of technology, particularly in respect of the new antimissile capabilities. However, France clung to what it liked to see as a possible opening when President Kennedy mentioned "a broader framework" and the fact that the Europeans must

[456] Later, President Kennedy asked General de Gaulle a question at the end of the letter: "Do you think that there is any prospect of you changing your positions, which would make it useful for us to consult on more depth on this issue [of the nuclear defence of Europe]?"

have the means to benefit from a nuclear force that could meet "their specific needs" (an allusion to the MLF, which was still in the project stage).

However, General de Gaulle was very annoyed by what he considered to be a rejection. His response to President Kennedy on 11 January 1962 adopted the same "friendly, but frank" tone, but did not pick up on the references to NATO and the MLF. While the crisis in Berlin continued, he started by reasserting the firm nature of the French position towards the attempts by the British and the Americans to "send out feelers" to Moscow. "What Khrushchev hopes to do is basically the neutralisation of Germany […]. [But] this would almost certainly lead to the neutralisation of Europe". We know that Chancellor Adenauer was particularly grateful to him for taking this position. As regards the nuclear issue, he replied:

> "You would like to maintain differences of opinion between us on this topic. In particular, while indicating to me that the United States are concerned by the fact that France is equipping itself with such weapons, you are telling me once again that they do not intend to help it to build any. But, as you know, France is not asking for this [...]. However, I in no way contest the value of your opinion in terms of the difficulty that France will face, due to a lack of space and resources, in securing for itself a deterrent that is even slightly equivalent to that of the Soviets. But how can we assess the degree of destructive power at which deterrence starts? […] [In respect of the Soviet rival], killing once or even only ripping out its arms could, at the end of the day, cause it to think. Moreover, in the West, France is not alone. Its atomic capability will indeed add to the power of the Free World. However, when the time comes, it will probably be advisable to organise the combined use of Western nuclear weapons."[457]

The French response was handed over by Ambassador Alphand[458] on 12 January 1962 on the occasion of a long meeting with President Kennedy. As the latter had returned to the Berlin question, he feared that the Western world "may not have envisaged all the requisite counter-measures". Hervé Alphand, with a certain premonition ten months prior to the Cuba crisis, replied that "it isn't just about Berlin or Germany, it may be necessary to react in other areas of the world where our strategic position in respect to the Soviets is better". Then, speaking in a "personal capacity", the ambassador responded to Kennedy's fears of a "nibbling away at Western positions and [of] the slipping of Germany into a desperate state of mind", using the argument that "in order for Germany to be attached, through a whole series of economic and political links, to Europe, and therefore to the West, it will be necessary for at least the three powers that own, to varying degrees, nuclear capabilities to agree on a common policy and strategy". President Kennedy, he added, "told me of the hope that he had placed in the European construction, which England might join and which would be linked to the United States through still-to-be-defined agreements". Economic and defence questions were thus

[457] Archives of the Ministry of Europe and Foreign Affairs (MEAE).

[458] Hervé Alphand resigned from his post as a financial advisor at the French Embassy in Washington in 1941 to join General de Gaulle in London, becoming one of his close colleagues. Between 1950 and 1956, he held the posts of representative to NATO, then to the UN, and ambassador to the United States, before being appointed secretary general of the Ministry of Foreign Affairs.

related in Kennedy's mind, as he was concerned about the balance of payments deficit and the "gold drain".

General Lavaud,[459] Ministerial Delegate for Armaments, had to travel to Washington in March 1962 to present a list of equipment to be purchased for 300 million dollars. When he met with him, Paul Nitze suggested that de Gaulle designate a personality that would be able to set up another meeting between de Gaulle and Kennedy to discuss the organisation of a "regular" dialogue that would "include the participation of the military and focus on global political and military issues".[460] He was encouraged in this endeavour by Ambassador Alphand who saw this role for himself. In Nitze's mind, the idea was still an offer that would be linked to a French commitment to the Alliance and to NATO planning. Paris did not respond. With the UK having applied for membership of the European Economic Community (EEC), Macmillan met General de Gaulle in Rambouillet on 15 and 16 December 1962. The latter set out his vision for cooperation between French forces and the Atlantic Alliance in Germany, the creation of a "European military command" and the common defence role of national nuclear forces.[461] For his part, Macmillan outlined a deal under which the UK's accession to the EEC would foster nuclear cooperation and pave the way for exchanges with the Americans, "since the latter strongly support Britain's application".[462]

Two months after the Cuba crisis in mid-December 1962, the United States pulled out of the project for the Skybolt surface-to-air missile, triggering a serious political and military crisis between London and Washington and testing the "special relationship" between the two capitals. US-British cooperation on this missile had started in 1960, replacing the Blue Strike project, which Britain was unable to finance. In return, the Americans had been given permission for their nuclear submarines to operate out of Scotland. But the British considered that the future of their nuclear force was dependent on Skybolt, which would allow them to extend the lifetime of their Vulcan bombers. In London, there was even suspicion of an attempt by some people in Washington to call into question the very existence of Britain's nuclear deterrent and to a transfer to the planned MLF. At the emergency meeting organised at the end of December 1962 in the Bahamas between President Kennedy and the British prime minister, Washington gave in to the calls of the latter and exchanged the Skybolt for the supply of Polaris missiles, a double base and a strengthening of the links between the British nuclear force and NATO. It was merely conceded that its nuclear force could be used for national purposes if the country's "greater interests" were threatened.

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[459] General Gaston Lavaud played a key role in the launch of the French nuclear defence programme. First, as head of the Armaments Cabinet of the President of the Council as of 1956, he coordinated all of the work in this field within the Defence Ministry. Later, as Chief of the Defence Staff from 1959 to 1961, he oversaw the development and implementation of nuclear-related military planning: this commitment was confirmed when he became First Ministerial Delegate for Armaments in 1961.

[460] State Department Nitze Fund.

[461] George Henri Soutou, *Ibid*. p. 228, based on the minutes of the meeting in the archives of the Ministry of Foreign Affairs.

[462] Cf. George Henri Soutou, *L'Alliance Incertaine*, *op. cit*., p. 230, who also recalls that London had already previously made proposals in the nuclear field and that the British had perceived the "*growing reluctance*" of Washington to help with the modernisation of British forces.

By accompanying the US-British arrangement of 21 December 1962 with a "similar proposal"[463] for Paris, President Kennedy, who had appreciated the attitude of General de Gaulle during the Cuba crisis, was taking the opposite view to his Secretary of State Dean Rusk; the latter, like his administration, had long been hostile to nuclear aid for France. This is clearly reflected in the memo that he sent the president on 26 October[464] in the midst of the Cuba crisis and which sets out four arguments against providing aid to France:

> "The British would be more reluctant to relinquish their own nuclear force if we were to help France create its own force at the same time. More generally speaking, our policy of seeking to conclude arms control agreements (non-transfer, limiting the deployment of MRBM [medium-range ballistic missiles], denuclearised zones[465]) would be weakened if we were at the same time to adopt measures to provide aid to a national programme.
>
> The unity of the Alliance would be compromised by making an offer that most of our allies and the NATO hierarchy (Nordstadt, Stikker, etc.) will criticise for providing specific aid to the least cooperative of the allies. This will lead to significant criticism, arguments, etc. at a time when we least need them.
>
> Moreover, the French are already supporting us in Berlin and Cuba, the continuation of this support will depend more on whether we consult them closely than on nuclear aid. Any improvement in their military position must depend on the re-equipping and the retraining of their conventional forces, which they have started to repatriate from Algeria.
>
> Lastly, another factor should be taken into account: the current crisis [Cuba] will probably exacerbate European concerns relating to their vulnerability to Soviet MRBMs and the fears of the European allies that the United States will enter into agreements in the nuclear field to their detriment. There are thus good reasons for the United States to make a gesture to them very swiftly in order to calm their fears. If such is the case, this gesture must of course meet the concerns of the whole of the Alliance".

De Gaulle, who had only been officially informed on 24 December of the Nassau Agreement, turned down Kennedy's offer. In his memoirs,[466] Ambassador Bohlen, whom Kennedy convened to Nassau, had already pointed out to the president that if, "in public relations terms, the offer is shrewd, de Gaulle will not see this as being particularly generous as he does not, at this time, have the means to build a submarine or a warhead that could be mounted

[463] In fact, slightly different, it would appear.

[464] State Department Archives.

[465] These were the first arms control measures adopted by the Kennedy administration: Moscow Treaty banning nuclear weapon tests in the atmosphere, preliminary discussions on the NPT, the Outer Space Treaty, etc.

[466] Charles Bohlen, *Witness to History 1929-1969*, Norton ed. 1973, p. 50-502

on the Polaris". Kennedy replied that acceptance of the Polaris by de Gaulle would enable "blocked amendments to the McMahon Act to get through Congress and to provide France with the information needed for it to become a nuclear power".

When he returned to Paris, Bohlen was received at the Élysée on 2 January 1963 and, when commenting on the US nuclear proposal, he mentioned the possibility of working together on the future development of the Alliance. General de Gaulle merely indicated that the offer would be examined carefully. At his press conference on 14 January, however, the General publicly rejected Kennedy's offer and slammed the door in the face of the UK in respect of its application to join the Common Market. Bohlen was particularly surprised since his British colleague had got the opposite feeling from a meeting at the Elysée a few days before in terms of how the Polaris offer had been received. The US ambassador wondered about the impact on the decision of the General caused by "the visit a few days earlier from the Under-Secretary of State Georges Ball, who had met de Couve de Murville to advocate for the MLF"[467] and explained to him that the principle of this force had just been accepted in Nassau by the British. Couve de Murville[468] had declared that France's participation was out of the question, but it would not oppose its creation, which was confirmed by General de Gaulle in his press conference. However, the French diplomatic service was soon to step up its opposition to the MLF, creating deep tensions with Germany.

President Kennedy, on the advice of Bohlen, who no longer thought that the position of General de Gaulle could be changed, refrained from causing controversy. This attitude was to be upheld by his successor, including at the time of the press conference on 21 February 1966 during which General de Gaulle announced that French forces would be withdrawing from NATO. The same restraint was shown on the French side and, in Washington, there was even surprise at the good conditions under which the withdrawal from the NATO forces and the financial compensations for the bases left by the allies were to be negotiated.

Did France miss a strategic opportunity in 1962 or, on the contrary, did it escape a diplomatic manoeuvre that would have led sooner or later to its nuclear capabilities being integrated into NATO's structures? The debate is still going on among historians, but there is no doubt that the diplomacy of the "pro-Europeans" (such as R. Bowie) in the State Department in respect of the MLF proposal played a central role. In fact, the internal contradictions within the project (de Gaulle called it the "multilateral farce"), the strong reservations of the British, and the French opposition, which became public in 1963 following the death of President Kennedy, led to the progressive shelving of the project.

During the period between 1958-1963, Washington sent out contradictory signs, increasing the degree of ambiguity surrounding what was really being proposed within the framework of the MLF. The State Department, for its part, maintained its opposition to any nuclear aid

[467] Charles Bohlen, *Witness to History 1929-1969*, *op. cit*.

[468] Maurice Couve de Murville joined the French Committee for National Liberation (CFLN) in 1943, then became a member of the Interim Government of the French Republic (GPRF). His close relationship with General de Gaulle earned him his appointment as Minister of Foreign Affairs in 1958, a post he was to hold for ten years. He was later to become Prime Minister.

for France. The successive positions of Kennedy remained ambiguous, but were always influenced by the desire for the complete Americanisation of the nuclear decision-making process, which was supported by Defence Secretary McNamara. Moreover, Washington probably underestimated, at the time, the technological ability of France to advance its nuclear military capability and, thus, its need for American aid.[469]

As regards the implications of the French choices on the conduct of operations in the European theatre, which significantly concerned the Germans, especially when France obtained the Pluton, then Hadès tactical missiles, General de Gaulle himself launched negotiations with the SACEUR, General Lemnitzer, during a hunting expedition at Rambouillet, which led to an agreement to coordinate with NATO on the potential use of French assets still stationed in Germany. The scope of the Ailleret-Lemnitzer agreements signed on 22 August 1967 was expanded in July 1974 following the conclusion of the Valentin-Ferber agreements between the head of the first French Army and the NATO commander Central Europe. The French-German dialogue continued during this period, but in a laboured manner. It was complicated by the parallel disagreements over the organisation of the EEC.

After witnessing the failure of the MLF in 1965, Washington now focused its efforts on Germany and the other allies in an attempt to secure their consent to the official adoption of the flexible-response doctrine. In exchange, Washington was to make an offer to the allies (except for France) in December 1966 to establish an information procedure relating to their nuclear strategies in the form of the Nuclear Planning Group (NPG).

Relations with Paris in the nuclear sphere were to be put on the back-burner until the election in 1969 of President Richard Nixon. During his first meeting at the Trianon on 1 March 1969, General de Gaulle, who had met Nixon previously during a private trip by the latter, confirmed[470] that "France will not sign the non-proliferation Treaty [signed the previous year], but that he does object to a large number of countries signing it. To be perfectly honest, France hoped that neither the Israelis nor the Germans would seek to acquire nuclear weapons". He emphasised that, from a military point of view, "the Europeans must not resign themselves to a subordinate role, but instead they must shoulder their responsibilities: the United States could significantly help them with this". Nixon agreed, indicating that "common ground must be sought at different paces and on different fronts". Washington subsequently started to lift its embargo on certain sensitive equipment.

The end of the presidency of General de Gaulle and the arrival of President Pompidou at the Elysée allowed for Franco-American dialogue to continue, including on nuclear issues, but this dialogue increasingly got bogged down in economic and monetary issues. In April 1973, Henry Kissinger launched "the Year of Europe", which, according to him, was to culminate in a

[469] It is difficult to assess the influence of self-deception compared to the influence of a campaign to smear French efforts; see the CIA memo of 1963, the substance of which was echoed by the *New York Times* and *Newsweek* and which reports on the difficulties encountered by the French in developing nuclear weapons. The CIA is said to have received confidential information from the US embassy in the person of the former General Gallois. The latter denied this. See Eric Branca, *L'ami américain*, Perrin, 2017, p. 348.

[470] Archives of the Ministry of Europe and Foreign Affairs (MEAE), minutes of the meeting in Nixon's archives.

summit bringing the Europeans and the Japanese together in order to organise a holistic Western approach encompassing economic and security issues: "Was it possible to reconcile the principle of Atlantic unity in the defence and security fields with the increasingly regional-oriented policy of the European Community?" he asked.

The Europeans gave the proposal a frosty reception. Already concerned about the debates in Washington on the Mansfield amendment proposing the repatriation of 150,000 GIs from Europe, they were also reeling from the agreement between the Americans and Soviets on the "prevention of a nuclear war" concluded on 22 June 1973. It was given a particularly frosty reception because they had not been consulted and, during the Yom Kippur War, Washington had put the NATO-assigned US forces in Europe on alert without even notifying the Atlantic Council. The French minister Michel Jobert vehemently denounced the document as an agreement between two superpowers designed to reciprocally protect their own territories. At NATO, they were bending backwards in autumn 1973 to draft the declaration demanded by Kissinger with a view to the Ottawa Summit to be held in June 1974. France, through its Permanent Representative François de Rose, took the initiative with a view to drafting a text for the Declaration by the Alliance. He rejected the globalisation of the competencies of the Alliance, which was sought by Washington, and astutely circumvented the question of the flexible response by merely mentioning that, in order to thwart the attempts of the enemy, "all the required force would be deployed".[471] Moreover, for the first time, he stipulated in a document of the Alliance that "two European countries have nuclear deterrents that contribute to strengthening the deterrent of the Alliance as a whole".[472]

3.3.3. The new challenges

For France, which was isolated and vilified over its nuclear stance, this was sweet revenge after twenty years of controversy. However, Paris was already experiencing fresh concerns over its deterrent due to the warming of relations between Moscow and Washington, arms control developments and the opposition to its tests in the Pacific.

Kissinger, who barely met the objectives of the "Year of Europe in respect of the European Union as well as NATO, had a different interpretation of the Ottawa Declaration when appearing before the US Cabinet:[473]

> "We had asked the Alliance to make the necessary adjustments to take account of the new realities [...]. Twenty years ago, we were faced with the Soviet monolith and its satellite states, the threat was unilateral, we had a monopoly over nuclear capabilities and the Third World was still colonised. All this has changed and we wanted the Alliance to reflect this. Europe believes in its force and is developing a greater awareness of itself. We have seen China become a rival to the Soviet Union within the

[471] See Article 8 of the Ottawa Declaration.

[472] See Article 6 of the Ottawa Declaration.

[473] *Ford Library archives*.

> communist sphere. We have seen the change in perceptions in the Middle East. Strategic relations have also changed. Everything is different. […] The Declaration is what we wanted... At the Summit, we will present the goals of the President's trip to Moscow and calm all the fears of a US-Soviet condominium. The change of attitude of the European governments in one year is extraordinary. Wilson is the most cooperative, Schmidt is more energetic and the change in France's attitude is remarkable. We solved the problem with France in thirty minutes in Ottawa and its minister of foreign affairs[474] spoke for the first time in English. This meeting was the most constructive one so far".

In fact, the Ottawa Declaration marked a turning point for the Alliance on an issue to which Kissinger referred: the development of the relationship between Washington and Moscow, and the apprehension and expectations that this caused in Europe. The *détente* had started to appear on NATO's agenda since the time of the Harmel report in December 1967 and Paris had started to become concerned about the implications of the 1972 SALT I Agreements, followed by the SALT II Agreements and the MBFR (Mutual and Balanced Force Reductions) negotiations. These were kicked off in 1973 and officially were only to focus on conventional forces, as Washington saw this as the best response to the Mansfield amendment. But both the Soviets and prominent figures from the German SPD party (the Social Democratic Party), such as Egon Bahr, saw a link between the strategic negotiations and the MBFR: for them, there were two complementary aspects to the *détente* and a means of ultimately achieving a new security system in Europe. President Pompidou was firmly opposed to the MBFR and was suspicious of the *Ostpolitik* of Chancellor Brandt, whom he suspected of being influenced by the ideas of Egon Bahr. He noted that these ideas were shared by a large number of French socialists.[475] He managed to make sure that the MBFR negotiation was not mentioned in the Ottawa Declaration, unlike the Conference on Security and Cooperation in Europe (CSCE) - France supported the CSCE aspects intended to bring together civil societies and, as Pompidou admitted, "to spread the freedom virus in the East".[476]

The SALT I and SALT II negotiations related only to the US and Soviet strategic systems, but the question of taking into account "third country forces", including France's deterrent, was already being asked by Moscow and rejected only fairly meekly by Washington. Moreover, as these negotiations did not focus on the non-strategic systems in both countries, the idea of a reduction – limited geographically to Germany and the neighbouring Warsaw Pact countries – in the tactical weapons stationed there was to be put forward by NATO within the framework of an "option III" designed to overcome the deadlock over the exchange of data: of sorts, a mini denuclearised zone at the heart of Europe, instating a strategic break between France and the Federal Republic of Germany. This dual concern of taking into consideration

[474] Jean Sauvagnargues, who had just replaced Mr Jobert as Foreign Affairs Minister, following the death of President Pompidou in April 1974.

[475] Up until 1978, François Mitterrand would support the idea of France's participation in the MBFR, with President Giscard d'Estaing supporting the completely opposite concept of the Conference on Conventional Disarmament in Europe.

[476] Private archives.

its forces in the strategic negotiation between the US and the Soviet Union and the creation of a special nuclear status for part of Europe (basically both Germanies) was to lead the French diplomatic service to take a significant new direction in respect of strategic affairs: it was to shift from resilience and resistance to a significantly more offensive stance, which it would never relinquish.

In response to the growing opposition to and criticism of its nuclear tests in the Pacific, despite stopping its atmospheric testing, France would demonstrate their harmlessness and start cooperating with neighbouring countries. It also successfully opposed the creation of the denuclearised zone in the Pacific that some in Washington were prepared to accept, given the importance of its strategic relations with Australia. The event led to some discreet diplomatic blackmailing with Washington in the field of non-proliferation. The shift to the Simulation programme allowed France to defeat a campaign that, within NATO and the region, targeted both the tests themselves and France's presence in that part of the world. It was to enable Paris to officially sign up to the NPT and the Rarotonga Treaty.

In terms of security in Europe, France was to secure the abandonment of the MBFR through its opposition, as of 1978, to the project for a "Conference on Disarmament in Europe", which aimed to refocus the debate on conventional weapons and proposed a large zone covering the territory of all of the member states of NATO and the Warsaw Pact. From 1977, the Euromissiles crisis was to lead Paris, which did not take part in the technical consultations within the Alliance, to publicly back the "double-track decision" and adopt a proactive diplomatic stance. It was, however, to contest the proposed negotiations on short-range missiles, based on the assumption that it was not taken into account in the INF Treaty, which was unwisely proposed by NATO. Lastly, France was also, and with great consistency, to strive to promote within NATO the preservation of a nuclear culture within an Alliance that, up until the political awakening triggered by the Ukraine crisis in 2014, had tended to consider nuclear weapons as a secondary concern compared to burden-sharing and the strengthening of its conventional forces.

The reversal in the position in which France was to find itself in respect of its allies was thus spectacular: while, up until 1974, it was the United States and NATO that sought to include our deterrent in their mechanism and to isolate us, the period that followed saw France, thanks to its independent nuclear performance, take the lead on these questions and attempt to bring the other allies to its side. The continuity of the deterrent policy conducted at the highest level, the good cooperation established between diplomats and those in charge of the nuclear programmes at the Defence Ministry and CEA, and a certain degree of consensus in public opinion gave rise to an outcome that it would have been difficult to imagine possible almost half a century earlier.

3.4. London and de Gaulle's 1958 tripartite nuclear proposal

Reception, consequences, symbol

Frédéric Gloriant[*]

In September 1958, Charles de Gaulle, who had been back in power for a few months, sent an extraordinary document to US President Dwight Eisenhower and British Prime Minister Harold Macmillan. In a memorandum dated 17 September,[477] he proposed nothing short of the establishment, at the highest level of the Atlantic Alliance, of tripartite political, strategic and nuclear cooperation on an equal footing between France, the United Kingdom and the United States of America. The document also contained very direct criticism of the functioning of NATO and proposals to reform it by enlarging the geographical scope of the Alliance and taking better account of France's national interests. Lastly, the memorandum suggested the immediate launch of tripartite consultations in Washington at ambassador level and at the level of the military representatives of the three countries within the Standing Group[478] in order to discuss how to implement France's ideas.

The memorandum embarrassed the Americans and the British, and was given a frosty and discouraging reception. It is true that a few consultations between the three countries did take place up until 1961 but, unquestionably, de Gaulle's plan to overhaul relations between France and its two "Anglo-Saxon" allies failed.

The proposal for a "Tripartite Executive Committee" has so far been studied from a transatlantic and Franco-American perspective, which is fairly easy to comprehend. Indeed, in de Gaulle's mind, the main recipient of the memorandum was the American president.[479] As he explained to the British ambassador to France, Gladwyn Jebb, in June 1959, the objective was indeed to "create a joint organisation between the Big Three with the authority to decide to launch a nuclear war".[480] However, faced with such a problem, it was up to the Americans first and foremost to take a stance. The reasons for the US refusal are indeed well documented by historians: it was impossible, even for a president who had as much empathy for de Gaulle and was also as pro-French as Eisenhower, to call into question the strategic monopoly that the United States had over nuclear issues, its leadership on East-West relations, or the

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[477] The full text is published in *Documents diplomatiques français* (hereinafter DDF), 1958-II, no. 165 and 170.

[478] The Standing Group is a tripartite institution within NATO, which the governments of the Fourth Republic would have liked to have made into one of the decision-making bodies of the Alliance where the three countries would coordinate their strategy.

[479] This is what Couve de Murville unequivocally explained on 6 November 1958 (Archives Nationales, Pierrefitte (hereinafter AN), 5 AG 1, carton 684, *verbatim report* of the meeting with Selwyn Lloyd): *"At the end of the day, the memorandum is first and foremost intended for the United States".*

[480] DDF, 1959-I, no. 368, memo of the Presidency of the Republic on the audience with the British ambassador, 22 June; for the British version, *United Kingdom National Archives*, Kew (hereinafter UKNA), PREM 11/3002, Jebb to the *Foreign Office* (FO), no. 207, 22 June 1959.

principle of integration within the Atlantic Alliance.[481] These were the main reasons for the failure of tripartism as of autumn 1958.

However, in addition to this Franco-American dimension, the specific role played by the UK in the "trilogue"[482] was neglected and too often conflated with the US position. Similarly, the intra-European dimension, i.e. French-British, of the triangular discussions on tripartism was neglected. This contribution intends to re-examine the crucial role played by the September 1958 memorandum in asserting the nuclear sovereignty of the Fifth Republic from an original British-focused perspective.[483]

The study of how Britain received the memorandum will enable us to highlight, by contrasting it with the atlantist UK of Macmillan, the specific nature of the strategic and nuclear identity of France at the start of de Gaulle's presidency. Then, an analysis of the various attempts to revive the idea of tripartism between 1959 and 1961, will show that, in addition to the failure of tripartism, which we tend to emphasise, this first embodiment of the foreign policy of de Gaulle gained increasing importance in the mind of Macmillan until it became a focal point of his initiatives, in particular in spring 1961. Finally, we will highlight the symbolic, or even mythical, value of this document, which was for a long time endowed with an aura of mystery, and explain the meaning that can be ascribed to it from a Franco-British perspective.

3.4.1. Disquiet in London over the emergence of de Gaulle's nuclear sovereignty

A. How to reply to the General?

The reception of de Gaulle's memorandum immediately caused great disquiet in London. The British government took over a month to produce a vague and hesitant response. Ambassador Gladwyn Jebb was charged with delivering it to the General on 21 October 1958 while accompanying it with oral comments intended to temper the rather negative content of the written response.[484]

Many factors prevented the Foreign Office and the British government from calmly assessing the substance of de Gaulle's ideas. First of all, the nerve, the lack of realism and the peremptory style of de Gaulle's proposals stupefied British diplomats. Indeed, de Gaulle was requesting nothing less than equal status from a strategic viewpoint not only with the United Kingdom, but also with the United States. Even though its strike force would only become

[481] Frédéric Bozo, *Deux stratégies pour l'Europe : de Gaulle, les États-Unis et l'Alliance atlantique, 1958-1969*, Paris, Plon, 1996, p. 36-43 et 49-54 ; Maurice Vaïsse, *La grandeur : politique étrangère du général de Gaulle, 1958-1969*, Paris, Fayard, 1998, p. 113-125 ; Marc Trachtenberg, *A Constructed Peace: The Making of the European Settlement, 1945-1963*, Princeton N.J., Princeton University Press, 1999.

[482] This neologism of Couve de Murville is cited by Jean Lacouture, *De Gaulle – 2. Le politique, 1944-1959,* Paris, Seuil, 1985, p. 639.

[483] This article is based on some of the conclusions of my doctoral thesis: "Le grand schisme. La France, la Grande-Bretagne et les problèmes euro-atlantiques, 1957-1963", Université de Paris III-Sorbonne Nouvelle, 2014. It will soon be published by Presses Universitaires de Rennes.

[484] UKNA, PREM 11/3002, letter from Macmillan to de Gaulle, *"delivered by Sir G. Jebb, 21 October 1958",* and telegram from Paris (Jebb) to the FO, no. 485, 21 October 1958; see on French side, DDF, 1958-II, no. 272 and 276.

operational in 1964, de Gaulle was acting in 1958 as if France were already an independent nuclear power.[485] In addition, agreeing to a "tripartite" discussion would definitely arouse the suspicions of NATO's other allies, in particular Germany and Italy, in respect of the institutionalisation of an executive committee within the Alliance. In this respect, the first question that Macmillan asked Jean Chauvel, France's ambassador in London, on 25 September, is revealing: how would the Germans perceive these tripartite consultations from which they would be excluded?[486] Such a development could cause NATO to implode. Finally, a more important factor for the British was that tripartism would risk interfering dangerously with the British-US "special relationship", which had been at the centre of Macmillan's diplomacy since January 1957.

B. The three Western powers in June 1958: an unbalanced triangle.

De Gaulle had hit the nail on the head with his memorandum, even more than he could have realised at the time. Indeed, after the diplomatic fiasco of the Suez expedition, Macmillan's priority was to restore the special relationship with Washington. He had skilfully managed to rekindle what Churchill had called "the Special Relationship", particularly at the Washington Summit in October 1957, taking advantage of the psychological blow caused in the United States by the successful launch of *Sputnik* by the Soviets.[487] Macmillan had secured significant concessions from Washington in favour of special bilateral cooperation with London in two areas that were also broached in the memorandum: first, "the most spectacular outcome"[488] of the Washington Summit was the reinstatement of nuclear cooperation between the UK and the US. This cooperation had ceased since 1946 due to the restrictive legislation adopted by Congress (McMahon Act). Since then, London had tried constantly to restore the nuclear alliance with Washington.[489]

But a second dimension of the Washington conference, which is far less known as it was kept secret for a long time, was the creation of an ambitious bipartite "machinery" designed to institutionalise consultations between the UK and the US on all issues relating to combating the Soviets.[490] A dozen British-American working groups were set up to focus on specific

[485] Archives of the Ministry of Foreign Affairs, La Courneuve (hereinafter AMAE), Pactes 1950-1960, carton 34, memo on "strategic problems and nuclear weapons", 1 July 1958: "France is already virtually a nuclear power".

[486] DDF, 1958-II, no. 199, conversation between Macmillan and Chauvel, London, 25 September.

[487] UKNA, PREM 11/2329, minutes of the Washington conference, 23-25 October 1957.

[488] UKNA, PREM 11/2329, Caccia (Washington) to FO, 25 October 1957, no. 2196 (communiqué and additional instructions for the Department of Information); see also the book by Harold Macmillan, *Riding the Storm: 1956-1959*, London, Macmillan, 1971, p. 313-330. The translations of quotes from works or archives written in English are my own.

[489] Read Jan Melissen, *The Struggle for Nuclear Partnership: Britain, the United States and the Making of an Ambiguous Alliance, 1952-1959*, Groningen, Styx publ, 1993.

[490] We use here the findings of Matthew Jones, "Anglo-American Relations after Suez, the Rise and Decline of the Working Group Experiment, and the French Challenge to NATO, 1957-59", *Diplomacy & Statecraft*, vol. 14, 2003, p. 49-79. The fact that the British and US archives related to the very existence of these bipartite working groups had been classified as and kept confidential shows how politically sensitive this undertaking was regarded at that time and for a long time afterwards.

themes or geographical areas,[491] including Algeria. Thus, the US diplomat Livingston T. Merchant, who was charged with preparing the Washington conference, rightly interpreted the British approach as a "supreme effort […] to win back the status of exclusive and equal partner of the United States, which it had enjoyed during the war".[492]

Although he never acknowledged this to the French,[493] Macmillan had gone a very long way, one year before the Suez Crisis, on the road to putting on hold the *Entente cordiale* with France, in favour of a renewed, but knowingly skewed special relationship, since the British prime minister accepted American leadership and explicitly used the term "junior partner" when referring to the role of the United Kingdom.[494]

C. The nuclear diplomacies of de Gaulle and Macmillan: a conflict of methods

As soon as de Gaulle returned to power, the Americans and the British rightly sensed that the new French leader would unsettle the fragile balance in Franco-Anglo-American relations.[495] In June 1958, because of his reputation and memories of the confrontations between de Gaulle, Churchill and Roosevelt during the Second World War, de Gaulle had already become "the ghost at the Anglo-American feast", according to the delightful expression coined by Nigel Ashton.[496]

Deep down, Macmillan had accepted a form of hierarchy between the UK and the United States in exchange for special access to US nuclear technology. British nuclear diplomacy in respect of the Americans was consequently flexible. In Washington, British diplomats broached the issue of nuclear cooperation progressively, on a step-by-step basis, without pre-determined set goals. They became experts at adapting to, or even manipulating, the complexities and contradictions in US bureaucracy.

By contrast, de Gaulle's nuclear diplomacy aimed to immediately call into question the asymmetrical functioning of the Western triangle. De Gaulle's method was to go straight to the point and to confront the Americans from the outset with the question of principle. "What

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[491] The list of topics covered is impressive: nuclear and military cooperation; improving links between the regional pacts; propaganda and information policy; economic measures to be taken in respect of the Cold War; for the groups focusing on geographical areas: Syria, Hong Kong, Algeria, later Indonesia and the Horn of Africa (M. Jones, "Anglo-American Relations after Suez", art. cit., p. 59).

[492] *Foreign Relations of the United States* (hereinafter FRUS), 1955-57, vol. XXVII, no. 309, p. 794-796, memorandum by Merchant to Dulles, 19 October 1957.

[493] See DDF, 1957-II, no.385 et 388, Franco-British conversations of 25 and 26 November between Félix Gaillard and Macmillan; the latter rejected the idea of any form of special nuclear cooperation between the United Kingdom and the United States and was angered by the accusations in the French press that the UK had tried to "sideline certain nations".

[494] FRUS, 1955-57, vol. XXVII, no. 268, p. 709-711, meeting between Macmillan and Eisenhower, Bermuda Summit, 21 March1957, 10h30: the expression "*junior partner*" was uttered by Macmillan at the first meeting of this summit, according to the verbatim record of the Americans.

[495] According to Dulles, this was "one of the most difficult [problems] that we [British and Americans] had to solve", UKNA, FO 371/137259, Caccia to Lloyd, no. 1362, 3 June 1958 (meeting with Dulles).

[496] Nigel Ashton, *Kennedy, Macmillan, and the Cold War: The Irony of Interdependence*, Basingstoke, Palgrave Macmillan, 2002, p. 129.

is necessary to us is what we have to obtain rather than an amendment to the McMahon Act",[497] can be read at the start of a memo from early summer 1958, summarising his instructions in the nuclear field. In this, there was not only a broad-ranging redefinition of the goals of the negotiation with the United States, but also a fundamental distinction between the goal formally assigned to France's nuclear diplomacy (secure what is "necessary") and the objective that, according to de Gaulle, had been that of the leaders of the Fourth Republic: an amendment to the McMahon Act allowing for Franco-American cooperation. At the same time, knowingly or not, de Gaulle was also breaking radically with the British approach, which had until then served as a model for the leaders of the Fourth Republic. Under no circumstances should the end (securing for France its own nuclear weapon and ensuring its participation in global strategy) be confused with the means (establishing technological cooperation with the Americans).

Thus, while de Gaulle was calling for a root-and-branch reform of the Alliance that would allow for the emergence of a multi-polar Western world, the cohesion of which would be based on a political understanding between several independent and equal pillars, Macmillan's approach was based on an implicit hierarchisation of the Alliance's powers, and therefore on the acceptance of a unipolar Western world based on American hegemony, and in which the British would play a similar role to that of Greek slaves freed by Emperor Claudius, educating the new Rome about its global responsibilities.[498] The British desire for influence thus clashed from the outset with the typically de Gaulle-like desire to restore sovereignty. This points to a deep-rooted, structural divergence in the political and strategic cultures of France and the UK, the origins of which were age-old and the repercussions still felt to this day.

D. The British caught in the crossfire

The immediate problem for London was to reconcile the impossibility of working in a trio with France on a basis as intimate as the British-American version, and the need to establish satisfactory ties with de Gaulle.

Indeed, the problem posed by the memorandum was particularly serious for the UK, which quickly found itself in a vulnerable situation in Europe. Autumn 1958 saw an exacerbation of the confrontation between two planned rival economic blocs: on the one side, the European Economic Community (EEC), or the Europe of Six, supported by Paris; on the other side, the Free Trade Area (FTA), which was to be larger and more flexible, supported by London.[499]

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[497] AMAE, Pactes 1950-1960, carton 34, memos on "Nuclear weapons", undated, not signed; the quote is in the introduction and in inverted commas. Though it does not appear explicitly, the author leaves barely any doubt.

[498] During the Second World War, Macmillan had theorised his approach to British-American relations through this now famous analogy (see Anthony Sampson, *Macmillan, A Study in Ambiguity*, London, Penguin Press, 1967, p. 61): "You must always allow your American colleague not only to have a higher rank to yours and a far better salary, but also give him the feeling that he is running the show. This will enable you to run the show yourself. We are [...] Greeks in this Roman Empire".

[499] On this topic, read Jeffrey Giauque, *Grand Designs and Visions of Unity: The Atlantic Powers and the Reorganization of Western Europe, 1955-1963*, Chapel Hill, University of North Carolina Press, 2002 ; Laurent Warlouzet, "De Gaulle as a Father of Europe: The Unpredictability of the FTA's Failure and the EEC's Success (1956–58)", *Contemporary European History*, vol. 20, 2011, p. 419-434.

Macmillan feared that an outright rejection of the tripartite proposal would affect the fate of the FTA due to de Gaulle, who would consequently reject it. That was why de Gaulle needed to be "appeased" by facade concessions on tripartism even though, essentially, the tripartite ideas were just as unacceptable to Macmillan as to the US Secretary of State Dulles.[500]

However, London was soon to be confronted with two painful developments, which undermined this tactic. Dulles, on 27 October, bluntly expressed his position on the British idea of possible bargaining over the FTA and tripartism. Washington did not feel obliged to appease de Gaulle or the UK; consequently, Dulles did not want the British, under the pretext of saving the FTA, to go too far in accommodating France's ideas as "he did not believe that the bilateral relationship between the United Kingdom and the United States, as it currently existed, could survive if it was expanded and formally recognised, as General de Gaulle appeared to want".[501] Thus, Dulles bluntly revealed the limit beyond which the British should not venture: not only were tripartism and the "special relationship" simply incompatible, but if there were any concessions to be made to de Gaulle, they would be very limited, and above all, it was Dulles himself, in Washington, who would determine the scope of these concessions. A few days later, France clarified its position. To the great displeasure of Macmillan, on 6 November, Couve de Murville, during a visit to London, announced outright that the French government was opposed to the FTA, as proposed by the UK, and that it would not be establishing any links between the debate over Europe and NATO issues, such as tripartism.[502] It was no longer possible for Macmillan to ignore the fact that France would not be engaging in any bargain with the UK over the FTA and tripartism.

The British position in early November 1958 was therefore very uncomfortable in the debate on the politico-strategic and politico-economic architecture of the Euro-Atlantic era; at European and Atlantic level, the two crucial negotiations in which London and Paris took part were conducted in triangular configurations in which British influence proved to be secondary.

The European triangle, comprising France, the UK and West Germany, played a decisive role in the outcome of the debate over the EEC and the FTA to the detriment of the "Greater Europe", which was supported by the United Kingdom, as Bonn ended up aligning itself with Paris. As for the Atlantic triangle, comprising France, the UK and the United States, it can be noted that, even though there were no significant British-American divergences over tripartism, Macmillan and the Foreign Office quickly had to content themselves with playing second fiddle to American foreign policy. This shows us the paradoxical effect of the restoration of the "special relationship". London had, in reality, consented to losing, to a great

[500] UKNA, PREM 11/3002, FO to all capitals of NATO countries, 3 October 1958, no. 1334; FO to Washington, 17 October; memo by Macmillan relating to his conversation with Mr Diefenbaker (head of the Canadian government), 31 October.

[501] UKNA, PREM 11/3002, Caccia to FO, 27 October 1958, no. 2900, §3-4.

[502] DDF, 1958-II, no. 318 (morning discussion on the FTA, 6 November); AN, 5 AG 1, carton 684 (*verbatim report* of the end of the morning meeting devoted to the memorandum and of the afternoon discussion about the FTA); UKNA, PREM 11/3002, meeting in the presence of Macmillan.

extent, control of the dialogue agenda with Paris. Increasingly, Franco-British relations were to depend on direct relations between the French and the Americans.

It was therefore without surprise that, after successive clarifications between Dulles and Couve de Murville, Britain's Foreign Office played a minimal role in determining the terms of the tripartite conversations that took place in February 1959 regarding the Far East and, in April 1959, regarding Africa. In October and November 1958, the British had somehow consented to being sidelined from discussions. This consequently facilitated the unilateral nature of Dulles's decisions, a fact that must of course have been noted by de Gaulle and French diplomats: the "trilogue" tended to be transformed into a Franco-American dialogue.

E. A complete failure?

The response to the memorandum was therefore doubly negative: on the part of the Americans in terms of the substance – no progress had been made towards accepting the "idea that the decision to use nuclear weapons fell to the three governments"[503], the Elysée noted – but also on the part of the British in terms of the method. At the end of the day, the British attitude within the "trilogue" in the autumn of 1958 (agreeing to being represented by the Americans in discussions with France, fostering a private bilateral dialogue with the Americans to "manage" de Gaulle, granting only marginal importance to direct dialogue with France) showed its reticence towards tripartism: London quite simply skirted the question posed in the memorandum.

The British in fact adopted the attitude that was most likely to maintain the implicit hierarchy that existed *de facto* between the three nations and which de Gaulle no longer wanted: this hierarchy placed the UK in a special position, "half-way between the United States and [the] other allies", according to the words of the British permanent representative to NATO, Frank Roberts, used to describe the British nuclear status, of which he thought France was jealous.[504]

Should we conclude, then, that tripartism was a complete failure? The trilateral interaction brought about as a result of the memorandum and the latent diplomatic crisis that this caused within NATO[505] had little perceivable effect at the time, but was still greatly felt by the British. The proposal to establish tripartism indeed contributed significantly to the placing on the back-burner of the secret British-American working groups set up at the Washington

[503] AMAE, Pacts 1950-1960, carton 35, memo of the *service des Pactes*, a.s. "Stratégie globale", 14 August 1959. By May 1959, de Gaulle's entourage was of the opinion that the "*geographical*" discussions had only served to "*hide* [the] initial *prevarication*" of Dulles – in January 1959, the latter had ruled out any tripartite discussions on strategy and planning (AMAE, Pactes 1950-1960, carton 35, memo by Boegner, 4 May 1959).

[504] UKNA, PREM 11/3002, Roberts to FO, 3 November 1958, no. 357.

[505] Anna Locher et Christian Nünlist, "NATO Strategies toward de Gaulle's France, 1958-1966: Learning to Cope", in Christian Nünlist, Anna Locher et Garret Martin (eds.), *Globalizing de Gaulle: International Perspectives on French Foreign Policies, 1958-1969*, Lanham, Lexington Books, 2010, p. 85-109 (in particular p. 85-93). It offers an interesting study of the reception of the September 1958 memorandum within NATO. The perspectives for NATO do not, however, allow for a satisfactory interpretation of a document, the goal of which greatly exceeded the scope of NATO.

Conference in October 1957.[506] In this respect, the demands of de Gaulle thus had the effect of calling into question the British-American bipartism of the years 1957-1958.

3.4.2. The many attempts to revive the idea of tripartism

What we are often unaware of, however, is that the trilogue continued well beyond the first attempt to establish it in early 1959 and that there were several other attempts to revive tripartism up until 1961. We also saw how tripartism gained in London, in Macmillan's mind at least, ever-increasing importance between the summer of 1959 and 1961, which contrasted with the minimum, or even negative, involvement of Britain's diplomatic service in the initial "geographical tripartism" of February and April 1959.[507]

A. Ambassador Jebb in favour of nuclear tripartism

The British ambassador in Paris, Gladwyn Jebb, undoubtedly played an important role in Macmillan's realisation of the need not to completely disregard the matter of de Gaulle's tripartite proposal. In June 1959, Jebb regretted the fact that "no attempt had been made to talk to [de Gaulle] about the substance of his plan and that a clear effort was made to dispense with it by organising discussions on minor issues".[508] He advocated that London take a firm initiative to ensure that the UK and the US made concessions to de Gaulle. At the end of an audience with the latter,[509] he understood that the crux of de Gaulle's aspirations was not the reform of NATO, but a decision on the use of nuclear weapons. Without actually advocating the existence of an absolute right of veto for each member regarding the use of nuclear weapons by the two others,[510] de Gaulle explained that he wanted to organise a strategic agreement between the three relevant nations and "define [together] the precise circumstances that would lead to a nuclear war". In Jebb's eyes, this request for "nuclear" tripartism was not "unreasonable".[511]

This position gave rise to intense debates in the Foreign Office, where Jebb was extremely isolated, surrounded by the guardians of the NATO temple. Thus, the other British diplomat

[506] M. Jones, "Anglo-American Relations after Suez", *art. cit.*

[507] AMAE, Secretariat General, Meetings and messages, carton 6b, f. 42-90, tripartite discussions on the Far East; f. 91-97 and 102-152, on Africa. It should be noted that, in respect of Africa, the British Ambassador Caccia launched the discussion with an outright attack on the legitimacy of the tripartite configuration to discuss such a topic.

[508] UKNA, PREM 11/3002, Jebb to FO, no. 200, 18 June 1959; no. 204, 21 June 1959. For Jebb, the tripartite consultations that had been accepted up until then were nothing but a *"Fabian manœuvre"*.

[509] DDF, 1959-I, no. 368, memo by Presidency of the Republic, audience with the ambassador of Great Britain, 22 June; UKNA, PREM 11/3002, Jebb to FO, 22 June 1959, no. 206-207, minutes and analysis of the meeting with de Gaulle.

[510] The speech of de Gaulle had been more radical on this point in January 1959, cf. DDF, 1959-I, no. 49, meeting with the head of the British Labour Party opposition, Hugh Gaitskell, 15 January: "In terms of triggering a nuclear war, each of the three powers should have an absolute right of veto, except in the event of a nuclear attack on its own territory". It should be noted that, in respect of NATO too, de Gaulle had hardened his line with Gaitskell: "NATO does not exist, it is an illusion", he declared.

[511] UKNA, PREM 11/3002, Jebb to FO, 22 June 1959, no. 207, analysis of the meeting with de Gaulle.

in Paris, Frank Roberts, drew on the consensus within NATO to reject any legitimacy to the demands made in the memorandum.[512]

The debates in Britain in the summer of 1959 about France and NATO are of great interest, as they reveal the precarious nature of Britain's nuclear status. Indeed, the high level at which de Gaulle placed his tripartite demands did in fact show the limits to the nuclear cooperation between London and Washington. For example, in a draft telegram intended for the embassy in Washington, we can read the following sentence: "If the General knew how vague our own arrangements with the Americans are, and if we could make him understand that it is impossible for us and the French to obtain the form of precise planning that he appears to expect, then perhaps he would be satisfied if the Americans were to give him the same informal assurance as the one they gave us".[513]

The distinction made between the informal bilateral commitment that the British were content with in terms of nuclear consultation[514] and the exhaustive planning requested by de Gaulle is striking (and clear!); however, the British deceived themselves into thinking that it was possible to persuade de Gaulle to downgrade his ambitions to the level accepted by London. Moreover, by agreeing to go along with the contradictions of an "imperfect" British-American nuclear consultation system, the British were resigning themselves to taking a line towards the French that was not very candid. Although they used the imperfect nature of the British-American relationship as an argument to persuade de Gaulle to content himself with the same,[515] they could not reveal to him all of the strictly confidential procedures and arrangements through which they had progressively sought to implement the US president's promise of prior consultation.[516] Transparency with France was thus structurally impossible and we can therefore only conclude that de Gaulle's suspicions of its British ally were legitimate.

B. Eisenhower's overture: the Rambouillet offer

After Jebb, it was the American president himself who, to the great surprise of the British, took the initiative, on two occasions, in December 1959 and May 1960, to revive the idea of tripartism, and consequently caused Macmillan to pay greater heed to it.

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[512] UKNA, PREM 11/3002, Roberts to FO, no. 214, 19 June 1959; no. 225-226, 23 June 1959.

[513] UKNA, PREM 11/3002, first draft telegram, not sent, FO to Washington, early July 1959.

[514] This was a "personal" commitment, i.e. verbal and completely confidential, that President Eisenhower had first made to the British secretary of state Anthony Eden in 1953, cf. UKNA, PREM 11/3002, letter from Rumbold (FO) to Hood (Washington), 9 July 1959.

[515] UKNA, PREM 11/3002, FO to Paris, no. 1659, 25 June 1959 (meeting Chauvel/Hoyer-Millar, 23 June): Hoyer-Millar asserted that there was no "secret [and] elaborate machinery to ensure Anglo-American cooperation on strategic and political planning", which was not exactly true, as he knew.

[516] UKNA, PREM 11/3002, second draft telegram, not sent, FO to Washington, early July 1959, containing the list of Anglo-American arrangements relating to information sharing, secure communications, joint decision-making over the use of nuclear weapons. We can also find the following recommendation: "We should not take the risk of jeopardising these arrangements, which are of great value to us, by suggesting [to the Americans] that the French could be included in these arrangements".

At the Rambouillet Summit in December 1959, Eisenhower, de Gaulle and Macmillan, who were joined for a number of sessions by Adenauer, met to discuss the Berlin crisis and the German question. This summit could have been the opportunity to make decisive progress on the tripartite ideas of the General at two levels. It was the first time that the American and French presidents and the British prime minister had the opportunity to meet together and discuss directly the September 1958 memorandum.[517] A tripartite summit was the *de facto* outcome,[518] even though the official pretext given as cover to the other allies was the Berlin crisis. But there was more to this: President Eisenhower appeared, at his own initiative and without first being solicited by de Gaulle, to agree to what he had rejected up until then, i.e. "a secret" tripartite "mechanism" where each country would be represented by three high-level civil servants, a diplomat, an economist and a representative of the military, based in London.

We can assume that the firm stance of General de Gaulle in respect of the Berlin crisis caused by Khrushchev, the skilful way in which he conducted the three- and four-party negotiation in Rambouillet and the perfect Franco-German solidarity impressed Eisenhower and persuaded him to concede more than he had done so far to secure close ties with de Gaulle's France. The fact remains, however, that the Rambouillet offer could have allowed for a real breakthrough. Macmillan was aware of this and responded favourably; he thought, in fact, that he had been helped out of a bind and hoped that, from then on, he would be able "to restore [the] old relations [that the British used to have] with the French without being disloyal to the Americans".[519] We can also consider *a posteriori* that the Rambouillet offer of 20 December 1959 corresponded to the maximum level of convergence between France and its British-American partners in the debate on tripartism.[520]

The problem is that it never came to fruition. The agreement reached at the summit between the three heads of state was quickly emptied of all substance through a quite extraordinary show of "backpedalling", to use Macmillan's expression, orchestrated by US Secretary of State Herter with the support of the diplomats from the Foreign Office.[521]

Indeed, the main circle of British diplomats, who were well aware of the contradiction between the "special relationship" and the tripartism demanded by de Gaulle – in that respect, they were far more lucid than Macmillan – had been immediately alarmed by the

[517] DDF, 1959-II, no. 295, Western Summit, part IV, meeting of the Big Three (de Gaulle, Eisenhower, Macmillan) in Rambouillet, 20 December 1959.

[518] Macmillan was struck by this, see Peter Catterall (ed.), *The Macmillan Diaries – vol. 2, Prime Minister and After, 1957-1966*, London, Macmillan, 2011, p. 262-264, entries for 19-20 December 1959.

[519] UKNA, PREM 11/3002, Macmillan to Lloyd, M506/59, 22 December 1959; see also PREM 11/2991, Macmillan to Heathcoat Amory (Chancellor of the Exchequer), 22 December 1959: Macmillan thought that, from that point on, he was "*in a good position to exert considerable pressure on [de Gaulle]"* over Europe.

[520] UKNA, FCO 51/87, *Tripartism and French policies towards the Atlantic Alliance 1957-1969*, dissertation by R. M. Bone (West Europe – Joint Research Dept.), §45-46.

[521] This episode is mentioned by M. Trachtenberg, *A Constructed Peace, op. cit.*, p. 242–244.

concessions made by Eisenhower.[522] Let us mention here three of the questions drafted by British diplomats intended for the Americans, which revealed what concerned them most about the Rambouillet Agreement:

> "v. In general, the new tripartite discussions will not replace the confidential Anglo-American discussions. Is that [...] clearly understood?
>
> vi. What is the Americans' point of view about sharing nuclear secrets with the French? Anglo-American cooperation in this field is very close and productive. Do the Americans want to, and can they, include the French and, if so, to what extent? We would like to hold preliminary discussions with the Americans on this issue.
>
> vii. The current nuclear strategy is very well coordinated between the Americans and ourselves. That could further improve in the wake of the current political and military discussions. The French demand to participate in nuclear strategy is not robust from a technical viewpoint. Do we intend to include them? If so, when and to what extent?"

The British notified Herter and were barely disappointed by his reaction: after being flabbergasted by the extent of the president's concessions, he took exactly the opposite approach and ensured that the Rambouillet Agreement was watered down.[523]

In the face of this manoeuvring, the action taken by Macmillan, who had been enthusiastic after the Rambouillet summit, was extremely indecisive. Concerned about the American backpedalling, he insisted that his "own personal honour was at stake" and "it would be dire for our relations with de Gaulle if the Americans were to try to back-pedal; it would be even worse if they were to deny the truth of what the President had said".[524] However, this is exactly what Herter did a few weeks later when he even claimed, contrary to all the evidence, that the Rambouillet offer had not been an initiative of Eisenhower, but instead of de Gaulle![525]

No firm British initiative was taken to counter the attempt to water down the agreement – quite the opposite in fact. The heads of the Foreign Office[526] skilfully managed to organise Britain's passive attitude so as to afford Herter the greatest leeway possible: they made sure that Macmillan did not get too involved in monitoring the tripartite issue despite his increasing

[522] UKNA, FO 371/152095, memo on the proposed tripartite discussions, Patrick Dean for Hoyer-Millar and Lloyd before their meeting with Herter, 21 December 1959.

[523] UKNA, PREM 11/2987, minutes of the meeting Herter/Lloyd, Paris, 21 December 1959 (i.e., the day after Eisenhower made his offer).

[524] UKNA, PREM 11/3002, Macmillan to Lloyd, M506/59, 22 December 1959; FO 371/152095, Macmillan to Lloyd, M522/59, 24 December 1959.

[525] UKNA, FO 371/152095, letters of Herter to Couve de Murville and to Lloyd, 3 February 1960. The British and French minutes of the meeting do, however, agree that the instigator of the Rambouillet offer was indeed Eisenhower; moreover, Macmillan was asked the question and replied that he was absolutely sure of the accuracy of the minutes of the meeting of 20 December, drafted by de Zulueta, see UKNA, FO 371/152095, Macmillan to Lloyd, M522/59, 24 December 1959, §1.

[526] Including the Permanent Under-Secretary of State, Frederick Hoyer-Millar; Patrick Dean, Deputy Under-Secretary; Anthony Rumbold, Assistant Under-Secretary.

interest in this configuration for consultations,[527] and they took advantage of his six-week trip to Africa in January and February 1960.[528] As for Jebb, whom we know had long been an advocate of tripartism, he was deliberately sidelined.[529]

Thus, despite Macmillan, the "mountain" from the Rambouillet offer ended up being a damp squib:[530] tripartite dinners at ministerial level in the margins of the many international meetings bringing together the three countries across the globe. This did not in any way pull Franco-British strategic dialogue out of the rut into which it had fallen by the end of 1958.

Macmillan thus failed to impose his choices on tripartism confronting the Foreign Office heads. We cannot help thinking that, during this backpedalling episode in the winter of 1959-1960, firmer directives from Macmillan, bolder bilateral dialogue with the French and clearer interventions by Eisenhower might have prevented the triumph over tripartism led by a transnational Atlanticist coalition comprising American and British diplomats, who at least partially circumvented their political leaders.

C. The ultimate test: bis repetita non placent *(repetitions are not well received)*

A very similar episode took place between May and August 1960, which was, for de Gaulle, the last real attempt at implementing the memorandum, the ultimate test, before the shift to the second phase of his foreign policy, which was much more focused on asserting European political and strategic independence. Several phenomena observed during the British-American backpedalling episode were repeated and exacerbated.

The initial impetus once again came from Eisenhower,[531] who was impressed by the firm stance taken by de Gaulle in the face of Khrushchev when the latter broke up the summit organised in Paris after the U2 aircraft incident.

We then observe the personal involvement of de Gaulle, who took the logic of the "test" to a higher level and set the bar very high from the outset by calling for strategic tripartism with meetings between defence ministers and chiefs of staff,[532] as well as a new tripartite summit.[533] In this respect, he urged Macmillan to advocate this request in his discussions with

[527] Macmillan let himself be talked out of sending de Gaulle a letter a few days after Rambouillet setting out how he wished to follow up on Eisenhower's offer, cf. UKNA, PREM 11/2997, draft letter to de Gaulle, 29 December 1959.

[528] This long trip to Africa marked by his famous "Wind of Change" speech, which Macmillan gave on 3 February 1960 in Cape Town, South Africa, in which he criticised the apartheid regime and called for the irresistible freedom movement of black peoples in Africa to be heeded.

[529] UKNA, FO 371/152095, letters of Jebb to Hoyer-Millar and Lloyd, 22 and 28 December 1959: Jebb asked to be kept informed, but to no avail. See also UKNA, FO 371/152097, sub-folder ZP 5/27: the letter from Jebb to Lloyd dated 17 March 1960 was only sent to its recipient after 30 May.

[530] The metaphor was coined by Frank Roberts, UKNA, FO 371/152095, letter to Hoyer-Millar, 13 January 1960, §6.

[531] DDF, 1960-I, no. 221, Paris Summit, part XI, meeting of the Big Three, 18 May, 17h.

[532] DDF, 1960-I, no. 263, letter from de Gaulle to Macmillan and Eisenhower, 10 June.

[533] Charles de Gaulle, *Lettres, notes et carnets, Juin 1958-novembre 1970*, Paris, R. Laffont, 2010, p. 259-261, letters to Eisenhower and Macmillan, 9 August 1960.

the US president and organise the Bermuda meeting – an "Atlantic" venue par excellence, especially as it had become the symbol of the renaissance of the British-American strategic and nuclear *entente* after Suez, and since the March 1957 summit had been held there. De Gaulle clearly intended to show that, symbolically speaking, there was a need to go beyond the purely "Anglo-Saxon" logic that had prevailed in 1957-1958 and create the real "West" by bringing into the fold France, which was a genuine European power (i.e. continental and independent).

Macmillan also personally involved himself in the tripartite debate to an unprecedented extent on 25 May 1960. He sent to the French and US presidents a memorandum relating to the "tripartite consultation machinery"[534] in which he advocated a discreet form of political tripartism run by an informal secretariat comprising a high-ranking advisor from each ministry of foreign affairs.

Once again, the diplomats from the Foreign Office played a leading role in watering down the new impetus in favour of tripartism. This is little known to historians, but the initial reactions of Eisenhower to the imperious demands made by de Gaulle had in fact been fairly positive: on 30 June, Eisenhower told Macmillan he could agree to organise tripartite military consultations in Washington, and added:

> "This will probably not be the global strategic planning body, including the issue of the use of nuclear weapons, [which de Gaulle] appears to want. But this is clearly progress in the field of military consultations, which could ultimately strengthen our alliance."[535]

To block the concessions planned by Eisenhower, diplomats from the Foreign Office took a very strong initiative on 19 July.[536] Without consulting the prime minister, they warned their American counterparts that, if they were not yet ready to discuss global and nuclear strategy with France or to assist the country with its nuclear programme, then it was dangerous to be so conciliatory towards de Gaulle. The draft letter by Eisenhower to de Gaulle was thus substantially amended to take account of Britain's objections. Thus, the line set by the closed circle of leading diplomats at the Foreign Office ultimately took precedence over the conciliatory indecisiveness of Macmillan.[537]

The main issue played out by de Gaulle and Eisenhower, with Macmillan playing a marginal role,[538] related to strategic tripartism and regular tripartite summits; however, both proposals

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[534] DDF, 1960-I, no. 236; UKNA, FO 371/152098, sub-folders ZP 5/40-41. See also the meeting between Debré and Macmillan on 19 May, at which the latter expressed his enthusiasm for a renewal of tripartism (DDF, 1960-I, no. 235).

[535] UKNA, FO 371/152100, FO to Caccia, no. 2962, containing the letter from Eisenhower to Macmillan dated 30 June 1960.

[536] UKNA, FO 371/152101, FO to Washington, no. 3293, 19 July 1960.

[537] Macmillan also sought, albeit very belatedly, to mitigate the negative message conveyed by his diplomats to the Americans, by addressing a slightly more positive letter to Eisenhower (the diplomats tried to dissuade him from sending this letter, but to no avail this time), cf. UKNA, FO 371/152101, Macmillan to Eisenhower, 22 July 1960.

[538] UKNA, FO 371/152102, FO to Jebb, no. 1590, 11 August 1960 (provisional response of Macmillan to de Gaulle's letter of 9 August); memo by Shuckburgh to Rumbold, 12 August 1960 relating to the intentions of the Prime Minister in respect of the idea of a Tripartite Summit in September; lastly, see PREM 11/3780 (telegrams from early September): we can see Macmillan once again oscillate between Paris and Washington and seek to portray himself to de Gaulle as being favourable to the idea of the summit without notifying Eisenhower (Caccia to FO, no. 1737, 2 September 1960).

had already been rejected by the Americans.[539] In the end, De Gaulle drew a definitive line under tripartism and publicly assumed the consequences of this on 5 September 1960.[540] However, he never formally withdrew his tripartite proposal, and in fact recalled it on a number of occasions with the new president, President Kennedy, without ever believing that it would happen immediately.[541] Tripartism thus became a sort of ideal designed to control what the "West", not simply reduced to American hegemony, should look like. It also served as a regular reminder of France's dissatisfaction with the functioning of NATO.

D. Macmillan's "posthumous" attempted revival and Kennedy's veto

There was, however, after this episode, a final "posthumous" revival attempt at tripartism at the initiative of Macmillan himself in 1961, which was completely out of kilter with the changing mindset of the author of the memorandum, whose priority was now an understanding with Adenauer to build "the European Europe" around the Franco-German *entente*.

Macmillan, who was still seeking a solution to redefine a satisfactory relationship between the UK and the Europe of Six, put forward what he called his "Grand Design", a long document running to around thirty pages, the focus of which was the issue raised by de Gaulle's France.[542] Macmillan said he would make a "supreme effort to reach an agreement with de Gaulle" by organising a grand bargain between France and the UK in order to find a satisfactory settlement for London to the European question in return for recognition of France as a great power on an equal footing with the United Kingdom.

This recognition had two dimensions. First, British diplomats would have to get Washington to agree to effectively institutionalising tripartism between France, the UK and the US. It would therefore be necessary to convince the Americans to reform NATO to take account of de Gaulle's criticisms, some of which were justified in the eyes of the British leader; Macmillan was talking about revitalising the Permanent Group, criticised the monopolization of military planning by the SACEUR and advocated a drastic simplification of the command structure.[543] Second, and it was here that Macmillan most departed from the Atlanticist paradigm that he himself had been using since 1957, London would now have to help France to fulfil its nuclear ambitions.

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[539] UKNA, FO 371/152102, Washington to FO, no. 3535, 4 August 1960, letter from Eisenhower to de Gaulle dated 2 August (in response to the letter of 10 June); FO 371/152103, FO to Washington, no. 3861, 2 September 1960, letter from Eisenhower to de Gaulle.

[540] Charles de Gaulle, *Discours et messages, vol. III*, Paris, Plon, 1970, p. 234-251, press conference.

[541] For some examples of these "attempts to revive" the tripartite deal, see C. de Gaulle, *Lettres, notes et carnets*, *op. cit.*, p. 444-446, letter to Kennedy, 11 January 1962 ; p. 506-507, letter to Macmillan, 6 November 1962 (written against the backdrop of the Cuba crisis).

[542] UKNA, PREM 11/3325, f. 57-88, memorandum of the Prime Minister, written between 29 December 1960 and 3 January 1961.

[543] Since summer 1960, Macmillan had really "drifted away" from NATO to the great displeasure of his diplomats (see UKNA, PREM 11/3334, *passim*).

In return, de Gaulle would agree to foster the alignment of the UK with the Europe of Six to overcome what Macmillan called "the political division" of Europe. This document was therefore a crucial stage in the British prime minister's shifting towards the UK's application for membership of the EEC. This would add a "Euro-nuclear" bargain to the already envisaged "Euro-tripartite" bargain.[544]

However, a blatant contradiction undermined Macmillan's bold approach: whether on the issue of tripartism or the nuclear deterrent, the road to Paris had to pass through Washington. The crux of the "Grand Design" (the Euro-nuclear deal) was intended to be presented first to President Kennedy, and then, only once it had received the green light from the US, to de Gaulle. Washington's consent was thus an absolute pre-condition for Macmillan's Grand Design. Moreover, the objective of British mediation would be to introduce a sort of second "special relationship" between France and the US, slightly below the one that traditionally and historically bound London and Washington, and which Macmillan could take advantage of to solve his European problems. The Grand Design was therefore in no way a break with the idea that the "special relationship" with Washington had to be maintained. Thus, the steps undeniably taken by Macmillan to accommodate de Gaulle's ideas on tripartism, NATO and the acknowledgement of France's nuclear ambitions were still limited in scope.

Macmillan mentioned his plan to Kennedy during his visit to Washington in early April 1961[545] and proposed that the "British be allowed to give either nuclear warheads or information to the French".[546] Resolutely adopting the position of a diplomatic advisor to the president of the United States, he sent him a letter on 28 April 1961 accompanied by a long and strange memorandum drafted in the first person, as if Macmillan were in Kennedy's place, comprising four appendices relating to "NATO", "Europe", "the nuclear deterrent" and "tripartism".[547] The appendix on the "nuclear deterrent", which was the most important one, contained the following proposals:

- The existing British-American arrangements on the use of strategic forces to support the Western Alliance could be extended to include France, whether this relates to targeting or a commitment to prior consultation before the use of forces.
- The French would agree to assign all of their tactical nuclear weapons to NATO, like the British.
- The Americans could give nuclear aid to France, either of a technical nature or in the form of nuclear warheads, so that further nuclear tests by France would become superfluous to requirements (and, therefore, France would be able to sign up to a potential nuclear test ban).

[544] See above Wolfram Kaiser, "The Bomb and Europe: Britain, France and the EEC Entry Negotiations, 1961-1963", *Journal of European Integration History*, 1/1, 1995, p. 65-85.

[545] UKNA, CAB 129/105/4, Washington Conference, 5-8 April 1961.

[546] UKNA, PREM 11/3780, f. 80-82, "continuation of the memo of the Prime Minister relating to his conversation with President Kennedy, Thursday 6 April, 14h45" (during the Washington Conference).

[547] UKNA, PREM 11/3311, f. 74-95, Macmillan to Kennedy (letter, memorandum and appendices), 28 April 1961.

- The United Kingdom would consider cooperating with France with a view to joint production of the nuclear weapon delivery systems.

The American response was unequivocal: on 8 May 1961, Kennedy indicated that he considered it "undesirable to assist France in its efforts to create a nuclear capability".[548] Faced with this rejection, Macmillan's close advisers considered approaching de Gaulle directly,[549] which was an idea that was supported by the Minister of Aviation Thorneycroft, who was amenable to de Gaulle's ideas.[550] All of this came to nothing and Macmillan never engaged in direct nuclear dialogue with de Gaulle, completely independently of the Americans. Macmillan did, as a consolation prize, succeed in getting Kennedy to agree to a meek revitalisation of tripartism... but this was almost immediately "scuppered in the dark corridors of the American Services".[551]

Lastly, let us note this simple fact, which is very revealing: de Gaulle had quite simply never heard of Macmillan's "Grand Design" even though he was the focal point of its implementation. It was undeniable that the constraints of the "special relationship" were greater than ever for London. Aside from its role in uncovering American hegemony, the memorandum highlighted the extent of the sacrifices required subsequent to the Atlanticist decision taken by Macmillan in January 1957.

E. The question put to the British in the memorandum

At the end of this analysis of the various attempted revivals and failures of tripartism, it is necessary to take a position in respect of the significant debate on the interpretation of the deep-rooted meaning of the September 1958 memorandum, which constituted de Gaulle's first major initiative on the Euro-Atlantic front. Let it be clear from the outset: we disagree with the theory that dominated for many years and which de Gaulle contributed to spreading,[552] according to which the memorandum was *merely* a diplomatic ruse and a means of exerting pressure on Washington and London, designed to pave the way for a more aggressive policy towards NATO and withdrawal in 1966.[553] The Franco-British perspective

[548] UKNA, PREM 11/3311, f. 67-69, Caccia to Macmillan, no. 1159, 4 May 1961 (meeting with Bundy about the missive of 28 April) ; f. 50-52, Kennedy to Macmillan, 8 May 1961 (formal response from Kennedy).

[549] UKNA, CAB 21/5556, from de Zulueta to Macmillan, 10 June 1961.

[550] UKNA, PREM 11/3311, f. 65-66, message from Thorneycroft to Macmillan, 4 May 1961, in which he suggested establishing contact with the French in the form of a visit of Bomber Command by General Stehlin, Chief of Air Staff.

[551] C. de Gaulle, *Lettres, notes et carnets, op. cit.*, p. 373, memo about an American project for tripartite consultations sent to Messrs Debré and Couve de Murville, 13 June 1961.

[552] Even de Gaulle expressed doubts to his closest advisers about the chances of seeing the memorandum implemented one day: see Alain Peyrefitte, *C'était de Gaulle – 1, 'La France redevient la France'*, Paris, de Fallois, 1994, p. 352 ; François Seydoux de Clausonne, *Mémoires d'outre-Rhin,* Paris, Grasset, 1975, p. 224 ; Institut Charles de Gaulle (ed.), *L'aventure de la bombe : de Gaulle et la dissuasion nucléaire : 1958-1969*, Paris, Plon, 1985, p. 311.

[553] See John Newhouse, *De Gaulle and the Anglo-Saxons*, New York, Viking Press, 1970, p. 78 ; Wilfrid L. Kohl, *French Nuclear Diplomacy*, Princeton, Princeton University Press, 1971, p. 74-81; Bernard Ledwidge, *De Gaulle et les Américains : conversations avec Dulles, Eisenhower, Kennedy, Rusk : 1958-1963*, Paris, Flammarion, 1984, p. 37 ; Lothar Ruehl, *La politique militaire de la Cinquième République*, Paris, FNSP, 1976, p. 41-54. Richard A. Butler, one of the most prominent ministers and rivals of Macmillan, expressed a similar opinion *a posteriori* (UKNA, FCO 33/47, letter from Butler to J. F. Ford (FO *Joint Research Department*), 27 March 1968).

shows, however, the crucial importance of the memorandum and the existence of a real resolve on the part of de Gaulle to implement the principles established in this document.

We need to return to the Second World War in order to understand both the symbolic importance of the September 1958 memorandum and the specific meaning of this initiative in respect of the UK.

"Being the most mysterious diplomatic document of the Fifth Republic", according to the words of Jean Lacouture, it was only published in full in 1976 in the journal *Espoir.*[554] This confidentiality is due to the fact that "partial satisfaction"[555] was given to the demands of de Gaulle, insofar as tripartite consultations did in fact take place up until 1961. It is true that these consultations were well below the ambitions of de Gaulle, as we have seen, but it was still a very sensitive matter for other NATO countries (in particular, Germany and Italy). The fact remains, however, that, despite this secrecy, the memorandum still took on significant symbolic or even mythical value, as shown for example by its furtive appearance in *L'Occupation américaine*, a novel by the author Pascal Quignard, published in 1994, which narrates the painful coming of age of two lonely teenagers in provincial France in the 1950s, which was deeply affected by the presence of the American military: "On 14 September 1958, General de Gaulle had sent a memorandum to President Eisenhower. On 11 March 1959, General de Gaulle withdrew the Mediterranean fleet from Interallied Command. In June 1959, the evacuation from NATO bases began. During the third week of July 1959, the GIs left Meung".[556]

Apart from the factual error with the date (which is merely a repetition of the same error made by de Gaulle himself in *Mémoires d'espoir*[557]), the dispatch of the memorandum is clearly linked to the end of the eponymous "American occupation".

But let's leave the fiction there, and return to de Gaulle's memoirs in order to draw a parallel between the memorandum and another of de Gaulle's proclamations, this time a public one with huge symbolic value, the Appeal of 18 June 1940. This parallel, which may appear to be bold given the evident differences in terms of context between 1940 and 1958, is suggested by a lexical detail that we discover when comparing *Mémoires de guerre* and *Mémoires d'espoir.* Indeed, de Gaulle, in his memoirs, uses the same metaphor taken from military terminology to evoke the appeal of 18 June and the memorandum: he "hoists up the colours".[558] This identical expression draws our attention to several similarities between the two texts; first, we have two documents that proclaim the principle of national independence, independence that must be restored because it was completely lost following the military defeat, or because it has been significantly eroded due to military integration within NATO and exclusion from nuclear decision-making. They are also two documents that constitute

[554] J. Lacouture, *De Gaulle – 2, op. cit.*, p. 639.

[555] Hervé Alphand, *L'Étonnement d'être : journal 1939-1973*, Paris, Fayard, 1977, p. 294.

[556] Pascal Quignard, *L'Occupation américaine*, Paris, Seuil, 1994, p. 201-202.

[557] Charles de Gaulle, *Mémoires d'espoir, vol. 1, le Renouveau, 1958-1962*, Paris, Plon, 1970, p. 214.

[558] Charles de Gaulle, *Mémoires de guerre. L'appel : 1940-1942*, Paris, Plon, 1954, p. 70 et *Mémoires d'espoir, op. cit.*, p. 214.

inaugural and solemn gestures charting a path for the future and containing something irrevocable to include the term used by de Gaulle himself in relation to the Appeal of 18 June. The memorandum is a "performative" proclamation in the strongest sense of the term, in the third paragraph, through which France's commitment to NATO was made conditional and "predicated" upon the Alliance developing along the lines wished for by France. What could appear to be blackmail was expressed soberly in the memorandum, but de Gaulle reformulated the idea more bluntly over the following months, including in his dealings with Dulles.[559] Finally, and last point in common, both documents contain a global geopolitical vision against the backdrop of a "Western world" made up of three Atlantic powers: in the Appeal of 18 June, after hammering home the message that "France is not alone", de Gaulle mentions England and the British Empire and then, later, the United States. Let us add that the word "West" is itself used right at the end of the chapter in which de Gaulle recounts the Appeal of June, in the sense of tripartism, when de Gaulle notes his agreement with Churchill, to "draw this banal, but definitive conclusion from the events that had broken the West: at the end of the day, England is an island, France the headland of a continent, America another world".[560] Here, we can already see a typically de Gaulle-like geopolitical representation of a Franco-British-American tripartite West with a necessary cohesion, but one that is difficult to fulfil as it is made up of three eminently different countries due to their geopolitical "personality". The enduring memory of the Second World War, for de Gaulle, would be a Western world that had failed to reform itself in the face of the existential threat from the East in the form of Nazi Germany (in June 1940, "the distress of France had failed to drag the United States out of its neutrality", he said sceptically to a Churchill who was eager for the United States to enter the war[561]).

This link with the Second World War allows us to understand the deep-rooted meaning of the memorandum in respect of the UK. There is no denying that, of the two addressees of the tripartite offer, Washington was the more important in the eyes of de Gaulle. Does this mean that the General did not care about the British response to the memorandum? This appears to be the opinion of Éric Roussel, who states that, at a meeting on 24 September 1958, the Secretary General of NATO, "Paul-Henri Spaak [listened to] the General explain to him very cynically his vision of matters, and say, in particular, that Great Britain [had] only been mentioned in the French memorandum for the record".[562]

This is an error of interpretation of de Gaulle's attitude towards London in 1958. The fact that de Gaulle openly explained to Selwyn Lloyd the anti-hegemonic dimension of tripartism on 17

[559] AMAE, Pacts 1950-1960, carton 35, meeting between Dulles and de Gaulle at Matignon, 15 December 1958.

[560] C. de Gaulle, *Mémoires de guerre*, *op. cit.*, p. 88. This conversation between Churchill and de Gaulle is said to have taken place in August 1940 at the end of an exchange of views between the two men on the issue of whether the Royal Air Force should have been deployed on the continent at the time of the Battle of France.

[561] *Ibid*.

[562] Eric Roussel, *Charles de Gaulle*, Paris, Perrin, 2007, p. 619. For the meeting between de Gaulle and Spaak on 24 September, DDF, 1958-II, no. 200 ; see also UKNA, PREM 11/3002, Roberts to FO, 3 October 1958, no. 277, §2 (minutes of a conversation between Frank Roberts and his German counterpart, Blankenhorn, to whom Spaak had shown the full text of the memorandum).

December indeed reveals the crucial importance of tripartism for Franco-British relations.[563] Whether the United States agreed to share more of its strategic responsibilities or whether it refused, and whether American hegemony was thus "uncovered" thanks to the memorandum, in both cases, de Gaulle's approach could serve British interests if we look at matters from his perspective. The question that the General was asking the British was the following: why does the UK not become "Gaullist", i.e. fundamentally British and independent, rather than Anglo-American, "Anglo-Saxon"? De Gaulle thus wanted to set London an extremely important test. Essentially, he was asking the British the same question as the one that he had asked Churchill fourteen years earlier on 11 November 1944.[564] Were the British ready to consider conducting their foreign policy independently from the United States? Were they prepared for a real dialogue with France on strategic issues and, for example, would they agree to help it with its nuclear programme, which could have led to a bilateral European nuclear partnership? In other words, were the British prepared not only to consider the French as their equals, but also and, above all, to consider themselves as the equals of the Americans in the strategic field? This was the condition demanded of the British in order to form a tripartite alliance – this ideal Western world that de Gaulle had proposed in his memorandum.

The memorandum caused a resurgence of one of the areas of disagreement between France and the UK, which had already caused the most serious of clashes between Churchill and de Gaulle since the Americans had entered the Second World War after the attack on Pearl Harbor. De Gaulle had on several occasions criticised Churchill for "tagging along with the United States"; according to him, Churchill's responsibility, who had fought the Germans from the very first outset, was to "take over the moral guidance" of the war in Europe.[565]

The idea was apparently still in the General's mind in June 1958. This is reflected in the words spoken at his first meeting with the American general in charge of NATO, Lauris Norstad.[566] He had indicated then that he did not understand why the United Kingdom did not hold the post of SACEUR (Supreme Allied Commander Europe). De Gaulle's inability to comprehend why the UK was unable or did not wish to oversee the defence of Europe is striking in its similarity with his position in 1942. This was a common thread in the thinking of the General in respect of the UK and the role that the country took in the world and in Europe.

[563] AMAE, Secretariat general, Meetings and messages, carton 6, f. 240-252, meeting de Gaulle/Lloyd of 17 December 1958.

[564] François Kersaudy, *De Gaulle et Churchill : la mésentente cordiale*, Paris, Perrin, 2003, p. 406-408.

[565] See the account of the clash between de Gaulle and Churchill on 16 November 1942, by Simon Berthon, *Allies at War: The Bitter Rivalry among Churchill, Roosevelt, and de Gaulle*, New York, Carroll & Graf, 2001, p. 217-218 ; read also F. Kersaudy, *De Gaulle et Churchill, op. cit.*, p. 229-232.

[566] This meeting was reported by the British Permanent Representative to NATO, cf. UKNA, PREM 11/2326, Roberts to FO, no. 102, 26 June 1958.

3.5. De Gaulle, nuclear sovereignty and the industrial challenge

Jean-Dominique Merchet[*]

I am not a professional historian, but I have a penchant for history and a certain attachment to the figure of General de Gaulle. I am going to talk to you about history all the same by talking to you about industry. When we mention the issue of Resistance and deterrence, we must obviously always refer to May/June 1940. General de Gaulle's idea was: never again, never again the rout of May/June 1940.

One of the major consequences of May/June 1940 was obviously the occupation of our country and everything that followed: for five years, which counted for at least double, or triple or quadruple in the industrial and technological history of the country, France was to find itself out of the game while the major countries, such as the United States, the UK, the Soviet Union, Germany, and their industries, engineers, scientists and armies made considerable progress over this period. Five years is an extremely short period of time, shorter than a French military programming law. During this period from 1940 to 1945, technology changed considerably.

Here are a few examples. In 1939, a few cutting-edge scientists started to think about the possibility, in theory, of manufacturing a nuclear weapon. In August 1945, two bombs were dropped on Japanese cities. What was the size of the aircraft engines? Initially, the aircraft developed in 1939-1940 had engines, the capacity of which could reach just about 1,000 horse power; five years later, we had reached 2,500 horse power, not to mention the formidable technological revolution ushered in by the invention of the jet engine. In 1940, there were no rockets. In 1944, they were falling on London. In 1940, aircraft and boats were virtually devoid of electronic warfare systems. By 1945, they were full of them. The heavy bombers of 1944-1945 were equipped with radar, countermeasure systems, and navigation systems. Submarines were much developed, since the technology developed by the Germans at the end of the war was the technology that was to be used in the field of submarines for the following 30 or 40 years.

However, France was out of the game because, quite simply, it was occupied and German domination prevented manufacturers, engineers and scientists from working. Some would still do so secretly with whatever they could get their hands on while others were doing the same out in the open with the help of considerable resources. The vast investment and research programmes in the UK, Germany and the Soviet Union were unimaginable. They made considerable progress, developed extremely sophisticated equipment and, above all, the capacity to manufacture this equipment. France was unable to do the same: it was out of the game.

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Take just one example: while our allies or our enemies or our future foes were manufacturing extremely modern aircraft, we were still assembling, at the aeronautical workshops in Colombes, Junker 52s under the name Toucan, which was an aircraft that dates back to the early 1930s.

We were completely out of kilter with what was happening in the rest of the world. This was the situation inherited by General de Gaulle and the Liberation governments. They were to express this absolutely decisive, permanent resolve to develop a world-class industry; first of all, the governments of the Fourth Republic and then, obviously, of the Republic of de Gaulle – a determination to develop a world-class industry, which continues to this day.

This goes without saying, but the nuclear deterrent plays both a structuring role and acts as a driver for this industrial and scientific ambition. France would not be what it is today if there had not been this ambition to develop a nuclear deterrent. There would be no *Ariane*, for example. There would be no civilian nuclear energy sector. Would France be manufacturing Tera supercomputers at Atos, formerly Bull, if there had been no development plans, no nuclear testing, and no nuclear ambitions? Of course not.

President Jacques Godfrain rightly said that de Gaulle was trying to combine modernity and sovereignty. This was very true. We often have a slightly conservative image of General de Gaulle, of a France of yesteryear. But one should never forget this great phrase in which he evokes oil lamps and sailing ships. He is not actually nostalgic about this era. He is a modern man. Already, in the pre-war period, he opposed the intellectual, strategic and military establishment, which had difficulty understanding mechanical warfare, as it was called at the time. In the 1950s and 1960s, he had understood that the era of this mechanical warfare – the large armoured divisions – was already obsolete and that it was time to start a new chapter.

We thus have this legacy that models and structures modern-day France. If we look at the major groups that contribute to the deterrent – let's just take a few of them – there is ArianeGroup (Airbus and Safran), Naval Group, Areva TA, MBDA, Dassault, Thales and a myriad of SMEs and medium-sized enterprises, which are the technological hub of our country.

When we look at the issue of the nuclear deterrent, there is a lot of talk of political resolve, diplomacy and strategy. There is a lot of talk of weapons. But the third pillar, which is just as important as the two others, is obviously the industrial and scientific pillar. The members of DAM, CEA and those of the DGA know this full well. But it is not necessarily very "sexy", so we tend not to take it into account. Defence is founded on three legs. It is quite a strange sort of meandering, but it walks on a political leg, it walks on a military leg and it walks on an industrial leg. If one of the legs is missing, failure is guaranteed. We should take heed.

Once last thing. We should ask ourselves whether this model, which has been magnificent, which makes, I believe, the France we love, is not running out of steam. We must wonder about this old-style industrial policy model with its large groups, political resolve and programming. We talk about programming when, in reality, it is the ardent obligation of

economic planning, as we used to say. But I think that we are confronted nowadays with a real risk of the model running out of steam. I have noticed two or three factors pointing to this. The huge difficulties of the civilian nuclear energy sector in France. And the civilian nuclear energy sector is a pure product of de Gaulle's ambition and of CEA. We can see today, when we look at Orano (formerly Areva) and EDF, that things are not easy. Our model is entering a difficult era. Also, we did not invent digital technology. But this changes everything. We see players in the digital sector arriving in areas that were, to put it in a nutshell, ours. The president of the National Centre for Space Studies (CNES) was talking about Elon Musk and Space X, i.e. the retrievable rockets with the first section that takes off, comes back and can be reused: "It will work". In three or four years, it will work.

New, unexpected players that do not come from the world we are used to, are starting to arrive in our industrial universe, which dates back to the time of the Reconstruction. Let us take a look at this with a great deal of interest and curiosity. We must not protect ourselves from this, but do as General de Gaulle did: challenge the models that we advocated twenty or thirty years earlier.

Chapter 4: French National Independence and Nuclear Deterrence, Past to Present

4.1. The relevance of the French nuclear deterrence in the 21st century

Bruno Tertrais[*]

Without wishing to be provocative, I would tend to say that the French nuclear deterrent has rarely been so legitimate, both in respect of our alliances and from the point of view of the potential threats. When we say that it confers freedom of action, on both our allies and our foes, I think that this is even more true today than it was twenty years ago.

In terms of threats, we are faced with the rise of a "new nuclear nationalism". In this context, the Treaty on the Prohibition of Nuclear Weapons, which was concluded in July 2017, seems to me to be a sort of "21st century version of the Briand-Kellogg pact". That is how sceptical I am as to its effectiveness.

In terms of alliances, we have had doubts for a long time in France. This is not the case with all Europeans. But, for different reasons, both under Barack Obama and Donald Trump, we have seen a return in Europe of the doubts that we previously had concerning the permanent nature of the US security commitment in Europe. However, for France, its nuclear capability has always been our means of securing strategic independence from Washington. This is something fundamental, and perhaps has not been well explained in recent years. The French nuclear deterrence above all gives freedom of action to France in respect of the United States.

I asked a question about this a few years ago: would France have led the active opposition – yes, "*led* the active *opposition*" – to the war in Iraq in 2003 if it had felt strategically dependent on the United States? This is a question I am still asking, and I still don't have the answer. I tested this assumption on some of the main stakeholders. But, by its very definition, it is only an assumption because strategic independence is a psychological phenomenon going on in the mind of the head of state. It is fundamental, but cannot necessarily be proven.

There is another contextual factor that, in my eyes, makes French nuclear deterrence even more legitimate than it was some twenty years ago, and that is the European context. Our British allies have confirmed their commitment to having their own permanent nuclear deterrent, but, given the complex period that Brexit will bring, the probable ensuing budget crisis and, perhaps, the political repercussions in respect of Scotland, I am not sure we can say that the long-term future of the British deterrent is as secure as that of the French deterrent. In any case, if the Brexit process is completed, France will be the only nuclear power inside the European Union.

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I note that this consensus in France is real and, above all, that it has stood the test of the generational changes: first of all, a first change of generation with the arrival in power of the post-1945 generation, Nicolas Sarkozy, François Hollande, followed now by the current head of state, Emmanuel Macron, who constitutes a new generational leap. This is a factor that, in my eyes, substantiates still further the French consensus. We can see that, even before his election, Emmanuel Macron had, during his candidacy, fully endorsed this legacy and, to the best of my knowledge, has never considered calling it into question.

Be that as it may, it is legitimate to ask questions.

There is a typical question that is asked regularly, but perhaps even more acutely nowadays: it relates to the long-term continuity and sustainability of the budgetary effort needed to develop the next generation of capabilities.

There are also, of course, the questions about the dimension I have just mentioned, i.e. the European dimension. Can we, should we, is it appropriate or not to state more clearly, against the backdrop I have just described, the European vocation, if indeed there is one, of the French deterrence? This is a topic about which successive presidents have been fairly cautious and timid, and they have never wanted to venture too far – after all, it is their responsibility, as it they who are authorised to use the weapons. But it is a question that warrants further reflection.

And, perhaps, some questions about doctrine? Ambassador Éric Danon explained that there had not been much debate in France about the questions of doctrine discussed in the United States. I am not sure that he was completely right. Perhaps we have forgotten the extent of the debates in the 1970s and the 1980s on central questions such as the famous final warning, which was the focal point of the doctrine. Perhaps we have forgotten that, in the early 1990s, many voices in the French parliament called for a change to our doctrine in the face of countries that were termed “proliferators” at that time. I am therefore not sure that we can say that there was no debate on doctrine in the post-de Gaulle period.

I believe, above all, that, structurally speaking, we cannot have the same debates on doctrine in France as in a country such as the United States, for many reasons. We have the doctrinal debates of a medium-sized power rather than a major power – perhaps of a great power, rather than a major power. When we observe, for example, the doctrinal debates in the United Kingdom, we can see that they were much less significant over the last fifty years and less lively than in France. And, above all, there was a huge difference in respect of the United States: it is not possible to have the same doctrinal debates when you are a country like France, whose deterrent was, until recently, focused on a single scenario and a single theatre, that of Central Europe. The operational dimension of the deterrent was geared, above all and in practice exclusively, to this theatre, whereas the United States has entered into several commitments, has different responsibilities and therefore different debates.

The French nuclear deterrence is thus “specific” in nature, but is more political than strategic.

4.2. French nuclear deterrence from inside: Testimonies from major players

*4.2.1. Jean-Pierre Chevènement**

For populations, war is always the moment of truth. This means that they are won and lost long in advance depending on the strategic doctrines, the efforts made to counter the threats, the quality of the workforce, the suitability of the weapons systems and, more than anything else, a "national will to live".

If I am labouring this last point, it is because there cannot be a good defence system for a people that has been defeated. Patriotism is not only the result of the spirit of sacrifice expected of soldiers. It is the ultimate guarantee that France will be able in the future to overcome the tests it is faced with, just as it enabled, in the past, a small exemplary elite to embody Free France and to ensure that the French Republic was regarded as one of the winners of the Second World War.

French nuclear deterrence was thus forged by the efforts of all those who had felt the wounds of 1940. It was the memory of the great collapse of our country that enabled it to dig deep into its resolve to obtain a military tool that would enable it to never again suffer the shame of capitulation plotted by those that Marc Bloch called "the new Bazaines".

"Never again 1940!" was the silent cry of the patriots in the generations that followed the Second World War. But as time went by, memories fade and die.

However, to consider the deterrent, as described by the German philosopher Sloterdijk, as a mere "counterphobic symptom" is a bridge too far for me, as the deterrent is, I believe, a political tool, a means for France not to be dragged into "a war that is not its own war".

Because of the end of the Cold War, the implosion of the USSR and the attempts at disarmament in the 1990s, the nuclear deterrent was subjected to its first major test.

It was also out of patriotism that a scientific elite, drawing on the resolve of de Gaulle and his successors, was able to derive from the unprecedented collapse in 1940 the ambition and the capacity to equip France with a nuclear capability, the ultimate guarantee of its sovereignty, without ever ceasing to adapt it to the strategic context.

It was also out of patriotism that this elite – the new generation thereof of course – succeeded, with Georges Baleras in charge of the *Direction des applications militaires* (Military Applications Division) (DAM) at the *Commissariat à l'énergie atomique* (Atomic Energy Commission) (CEA), followed by Jacques Bouchard, Alain Delpuech**,** Daniel Verwaerde and François Geleznikoff**,** in giving France a simulation capability that would enable it to equip itself with robust nuclear weapons without having to carry out nuclear tests.

There was no guarantee, in the wake of the moratorium in 1992 and the end of nuclear tests in 1996, that the Simulation programme would be a success, but, despite this, it was: France is now capable of manufacturing its own robust nuclear warheads, airborne nuclear warhead

* Former French Minister. President of the *Res Publica* Foundation

and seaborne nuclear warhead, without having to resort to nuclear tests. This scientific feat could not have been achieved without the patriotism of the teams from CEA and its Military Applications Division.

It is also thanks to the patriotism of the crews of the nuclear-powered ballistic missile submarines (SSBN) and the Mirage and that of the engineers and managers of the *Direction générale pour l'armement* (DGA – General Directorate for Armament), who were keen to maintain an industrial and technological base capable of manufacturing nuclear warheads and the necessary delivery systems – submarines, aircraft and missiles – that this huge national success was possible.

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I would now like to show how the French national consensus on nuclear deterrence was forged during the years that preceded and followed the arrival in power of the Left in 1981.

We remember that, at the start of the industrial effort that allowed for the deterrent to be created, two military programming laws were adopted in the face of opposition from those who spoke of the "*bombette*" or "*bombinette*" (little bomb) by invoking Article 49.3 of the Constitution.

However, it would be wrong of us to forget the efforts made by the major players of the Fourth Republic to pave the way for the first nuclear weapons experiment in 1960 and the Gerboise campaign that followed. Three other airborne experiments took place in 1960 and 1961.

It was Pierre Mendès France and Guy Mollet who adopted the decisions in principle (the former in 1954), and provided the necessary appropriations (the latter in 1956). I am not saying that to play down the efforts of Guillaumat and Goldschmidt, who worked hard within the CEA, but merely in order to paint a faithful picture.

We should also recall the contribution of Frédéric Joliot over the five years after the Second World War before his removal because he was a communist and the Cold War was starting. This was a great loss from a scientific viewpoint.

I am now going to evoke a lesser-known episode: the Left's adhesion to nuclear deterrence in the decade from 1971 to 1981.

The Epinay Congress adapted the PS (Socialist Party) to the institutions of the Fifth Republic. François Mitterrand had already been the lone left-wing candidate in 1965 thanks to Waldeck Rochet, then secretary general of the PCF (French Communist Party), who had met Mitterrand in London.

François Mitterrand became first secretary of the PS at the Epinay Congress and therefore the left-wing candidate for the presidential election due to a combination of three forces: his own force, the CIR (*Convention des Institutions Républicaines* – Convention of Republican Institutions) and that of the right-wing of the SFIO (French Section of the Workers' International) (Mauroy, Deferre) and the left-wing of CERES (*Centre d'Etudes, de Recherches et d'Education Socialistes* – Centre for Socialist Studies, Research and Education).

The CERES was a small group of former pupils of ENA (*Ecole Normale d'Administration*) and Polytechnique, which got a great deal of its strength from the support it received from the association of Socialist postal workers of Georges Sarre, 8.5% of the votes, which tipped the balance in favour of a particular line: the union of the left, which was based on a joint manifesto with the PCF, itself developed on the basis of a Socialist manifesto titled "Changing lives", of which I was in charge. This was adopted in April 1972.

The joint programme was also adopted on 30 June of the same year.

CERES, in terms of institutions, foreign and defence policy, basically shared the ideas of General de Gaulle. CERES was a think-tank and a political movement within the PS.

In a 1966 seminar, Robert Verdier and Jules Moch said to one of us, Loïk Hennekinne, who had been first secretary to our embassy in Saigon: "How can you make a career with such ideas?". Another, Jacques Darmon, was, with my agreement, called into the cabinet of Michel Debré, who was then Minister of Defence; that was in 1970.

At the time, having returned from Algeria, I had espoused along with my friends, Gomez, Motchane, Hennekinne and a few others, General de Gaulle's doctrine on nuclear deterrence. How could the PS be won over? I basically trusted the logic of the institutions. François Mitterrand was to implement his "*aggiornamento*", but he first had to be won around.

June 1971: I was national secretary of the PS, in charge of the manifesto. First of all, I had to convince Georges Sarre to insert three options into the preliminary draft manifesto submitted to the steering committee in the autumn of 1971. This was the most difficult task, as Georges Sarre espoused the Socialist ideas of the time on this issue. But he trusted me because he was my friend. And his support was decisive in order to win CERES round to nuclear deterrence.

In the preliminary draft manifesto submitted to the PS steering committee in autumn 1971, I inserted three options:

- Developing the deterrent,
- Maintaining the deterrent,
- Abolishing the deterrent.

After a debate within the steering committee, only two options remained:

- Maintaining the deterrent,
- Abolishing the deterrent.

It was on this premise that the debate within the party took place. The first option had minority support, but got a good score. CERES was the lead in this operation, which was defended on the Convention stage by Charles Hernu. He was the agent that François Mitterrand had appointed to monitor military issues.

The day after Epinay, a PS Defence Commission was set up and would report to the national secretary for the manifesto, which was my role.

Charles Hernu, Jacques Huntzinger, Pierre Bercis and I were appointed to run it. We set up an association called the *Convention des officiers de réserve pour "l'Armée Nouvelle"* (Convention of reserve officers for the "New Army"), which was the title of a book by Jaurès on the call to arm the nation. This association bore the acronym "CORAN" - would you believe it?!

During this time, CERES was growing, securing over 25% of the mandates at the Pau Congress in 1975; relations with the PCF caused the latter, or at least Jean Kanapa, in charge of foreign policy in the political bureau of the PCF, to see that nuclear deterrence was related in some way to the nation's independence – to such a point that by the time the joint government programme broke down in 1977, the pretext put forward by Georges Marchais, who was on holiday in Corsica, was: "François Mitterrand wants to give up deterrence and therefore national independence…"

This shows that the leaders of the PCF had undergone a considerable change in their intellectual mind-set since 1972.

The day after a narrow defeat in the legislative elections of 1978, François Mitterrand deemed that the time had come for the *aggiornamento*. A national convention on defence was convened. François Mitterrand realised that he could not be a candidate for the presidency of the Republic if he were to abandon the French nuclear deterrence. The debate was an animated one. Jean-Pierre Cot defended the traditional position of the Socialists, but was confronted with the combined forces of CERES and Charles Hernu.

The friends of François Mitterrand and all the leaders of the federations who were "in the loop", primarily the Nord and the Bouches-du-Rhône, rallied to the option that Hernu and myself were proposing ("maintaining" the deterrent). The rest is history: François Mitterrand was elected in 1981 and the line on nuclear deterrence was maintained:

- Charles Hernu was the first Minister of Defence (1981-1985),
- Paul Quilès, after the resignation of Charles Hernu, held the post and would launch most of the programmes (PAN-Leclerc, etc),
- André Giraud succeeded him and submitted the Military Programme Law 1987-1991 for adoption, which itself was replaced by the Military Programming Law1990-1993, which I was in charge of.[567]

This was the period during which the Strategic Nuclear Force (FNS) and the so-called "pre-strategic" weapons were ratcheted up.

The year 1985 saw the launch of the TN 75. The Hadès missile was manufactured to replace the Pluton. A range of 400 kilometres instead of 80. Transported on a wheeled vehicle, it could be moved around more quickly than the tank chassis used for Pluton. The only incident that occurred during the political cohabitation of 1986-1988 was the S4 scandal, known as the

[567] Jean-Pierre Chevènement was Minister of Defence from 1988 to 1991.

"missile on wheels" scandal (missiles boarded on unmarked HGVs). For reasons relating to the consensus, François Mitterrand was against their deployment.

I still have a few memories from the time before I was Minister of Defence:

François Mitterrand one day stated: "I am the deterrent". This was perspicacious, as the President of the Republic is indeed the sole decision-maker. Gone were the times when he mocked the "*bombinette*" (little bomb). François Mitterrand declared one day somewhat enigmatically: "The Plateau d'Albion is the tip of the diamond that is our deterrent". When I asked him why, he said: "Because an attack against the Plateau d'Albion would mean the signature of the attacker and would expose it immediately to our response". I made do with this explanation, even though, to my mind, the notion of vital interest should be interpreted more broadly.

François Mitterrand and I had another debate, which reflected the one that he had with Helmut Kohl about the future of our "pre-strategic" weapons. I thought I had convinced him of their value in deterring any deployment of tanks and, consequently, any armoured offensive. I remember Helmet Kohl's face at the July 14 procession in 1989 when the Plutons appeared on the Champs-Elysées. In my mind, the Hadès, with its longer range and greater mobility, would have assuaged the understandable fears of the chancellor. But the Hadès was progressively withdrawn as of 1991, i.e. after I had left the Hôtel de Brienne (Ministry of the Armed Forces). At that time, in 1991, our arsenal comprised some 600 nuclear warheads compared to 300 currently.

After 1991, the era of disarmament started. The announcement of a moratorium on nuclear tests, in 1992, by the new Prime Minister Pierre Bérégovoy, before the National Assembly, where I had taken up my seat, stunned me.

This was a concession to the ecologists in the run-up to the 1993 elections. I was shocked, as the moratorium meant the end of the tests and there was no guarantee that we could develop a simulation programme capable of guaranteeing the long-term sustainability of our strategic deterrent. It was yet another reason for me to distance myself from the Socialist Party. And it was not the only one.

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Nuclear deterrence is more necessary then ever in a multipolar world where nuclear arsenals are being developed in East and South Asia, and where the balance is precarious (as well as in the Middle East).

Deep down, I am concerned, despite flattering polls.

First, there is the permanent temptation to disarm. The speech by President Obama in Prague in 2009 kept up the illusion of "a world without nuclear weapons". The pressure from non-nuclear countries has heightened within the United Nations with the prohibition treaty adopted but not ratified by 122 countries. This movement has resonated, including in the highest spheres. We all remember a letter to the editor of *Le Monde*, co-signed by two former

prime ministers, a former defence minister and a former chief of the military staff of the prime minister.[568] Our military leaders feared that our conventional forces would be squeezed out.

My fear is also of a budgetary nature, due to the "dent" that will have to be absorbed in order to launch the third-generation nuclear-powered ballistic missile submarine (SNLE) as of 2020, the M51-4 missile as of 2022 and, finally, the structural choices that the renewal of the delivery system component will entail. This relates to the concept of a hyper-rapid missile and the consequences for the aircraft carrier.

Third source of concern: in the eyes of public opinion, terrorism appears to have circumvented nuclear deterrence. Let us not forget, however, that in the future there could be state terrorism. Several powers in the world could slip into a form of radical extremism and are already getting close to developing nuclear capabilities. North Korea and Pakistan already have nuclear weapons (as do Israel and India). Iran is close to achieving this. The agreement of 14 July 2015 fortunately freezes this situation. Turkey, Saudi Arabia and Egypt could be tempted to develop such capabilities as well. Hence the importance of maintaining the Non-Proliferation Treaty (NPT). It is a fragile barrier, but at least it exists.

Finally, the European context is also, in my mind, a fourth source of uncertainties. Europe is no longer shielded from long-range missiles from Asia. For example, North Korea has benefited from ballistic technology transfers from Ukraine, it would appear, at non-governmental level. France is the only nuclear power on the continent. Deterrence must remain a *national* deterrence. The concept of an "extended deterrence" can be determined in due course. It cannot give rise to prior public commitments, even less so to treaties. French nuclear deterrence contributes to the defence of Europe, but must remain a national deterrence. There can only be one decision-maker: the President of the Republic, who assesses the vital interests of France.

The consensus on nuclear deterrence must be preserved. Nuclear deterrence contributes to the balance and security of Europe. Russia is still a major nuclear power. The Russian army is no longer and will never again be the Soviet army. It is not in our interests to step into a new cold war on our continent. But the security of Europe implies a balance of power, to be negotiated, at the lowest possible level. France's nuclear deterrent is not and must not be managed by NATO's Nuclear Planning Group.

It guarantees French independence and Europe's strategic autonomy.

The future of our deterrence depends on the continuation of the national consensus and, as a last resort, on French patriotism itself.

French nuclear deterrence has been, is and will be the daughter of the spirit of resistance of the French people!

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[568] See the open letter "*Pour un désarmement nucléaire mondial, seule réponse à la prolifération anarchique*" (Towards global nuclear disarmament, the only response to anarchical proliferation) by Messrs Juppé, Norlain, Richard and Rocard, 14/10/09, URL : http://www.lemonde.fr/idees/article/2009/10/14/pour-un-desarmement-nucleaire-mondial-seule-reponse-a-la-proliferation-anarchique_1253834_3232.html [consulted on 13.04.2018]

*4.2.2. Henri Bentégeat**

In the spring of 1966, General Ailleret, Chief of the Defence Staff, was presenting France's defence policy to the students of Saint-Cyr, of which I was one. Full of the memories of the Indochina and Algerian wars in which our teachers had fought and reluctant to admire this former Polytechnique student who embodied a weighty and distant authority, even if he had been a member of the Resistance and been deported, we were stunned, literally, by his demonstration. His imposing silhouette, his poker face, flanked by a large pair of glasses, and his monotonous tone, added to the force of his words: "Nuclear weapons are the cornerstone of any future military strategy". We were expecting him to refer to NATO, a few weeks after the announcement of the French withdrawal from NATO's military structure, but he merely quoted General de Gaulle: "From a security point of view, our independence requires, in the nuclear age in which we live, that we have the means to deter a potential attacker without prejudice to our alliances, but without our allies ever holding our destiny in their hands".

From his cold and sometimes technical presentation, we learnt about the vital role played by the air force and the navy in building the new structure, even though he suggested that the army could be equipped with tactical missiles. The crux of what he was saying, I think, can be encapsulated in a simple idea: thanks to the Bomb, we were finally free from the overbearing guardianship of our great American ally.

"We have chosen independence", declared the General on 27 April 1965. "Each nation must be responsible for itself [...]. There is now a French policy and it is decided in Paris". Fifty years later, this founding principle of our foreign policy, which was self-evident for a people that had been humiliated in Suez in 1956 and traumatised by the colonial wars, had taken on a new allure, which was more compatible with our aspirations for the creation of a European defence force and our return to NATO's military structure. Maintaining "our strategic independence" is still one of the objectives of our defence policy but, in a context where globalisation and inter-dependence make it difficult to do it alone, emphasis is placed on Atlantic or European solidarities. The new threats, especially Islamic terrorism, blur the role of nuclear deterrence within the framework of the globalising concept of the defence-security *continuum*. The fact remains that the freedom to take decisions and action enjoyed by our country, which has been demanded by all the successors of the founder of the Fifth Republic, is still founded on the credibility and independence of our nuclear deterrence and on the capabilities of our defence industry.

Georges Pompidou saw himself, in this field, as the conscientious heir of the founder of the Fifth Republic. Under his seven-year term cut short by his death, the Plateau d'Albion and three nuclear-powered ballistic missile submarines (SNLE) were commissioned.

The lieutenant that I was back then, serving in a mechanised regiment in the region of Paris and confronted with scarce resources, paid only scant attention to this. Despite a considerable defence budget, the conventional forces were suffering from the resources allocated to

* Army General, former Joint Chief of Staff

building up the nuclear triad. In 1969, the latter accounted for half of the investment appropriations and, in 1974, a further third.

However, we were not insensitive to the prestige and implications of the strike force. After an exchange lasting a few days with a German squadron equipped with Léopard tanks, I witnessed the bitterness of my subordinates, who were appalled by the luxury and the modernity of the armoured units of the *Bundeswehr* and by the condescension of our allies towards our old AMX 13 and our rudimentary equipment. I therefore decided to convene my officers and conscripts to explain to them the doctrine and means of our nuclear deterrence. That day, they all understood that, despite the relative poverty of our armoured and mechanised corps, France had become a great military power. After the defeat in 1940 and the painful adventures of decolonisation, our country had taken up its place once again in the concert of nations.

Pompidou had approved the 1972 White Paper drafted by Michel Debré. For the first time, our national defence policy was officially presented and described in detail in a public document. It was not bedtime reading for the junior officers, but even the least curious of souls would find in this paper confirmation of the line set out by General Ailleret: "The existence, independence and strength of France are the starting point of a policy that draws naturally on the sentiment of the nation". The principles of French nuclear deterrence were described in the paper in simple and clear terms, which still hold to this day, and the role of the conventional forces was explained in a reassuring manner for those serving in those forces. Pompidou, as we know, had no more appetite for abstract theories than the General. He had endorsed, without any scruples, the "all-out" nuclear strategy, which characterised the national independence of France almost to the point of insolence. When we were having our meals, however, we would talk about the limits of our deterrence: would we go as far as to threaten our allies if they blackmailed us? The White Paper, however, asserted our total solidarity...

The question was not an innocent one at a time when the thawing of relations between the two superpowers could have led to an agreement at our expense. The latter years of Georges Pompidou's presidency were overshadowed by the spectre of a Russian-American *condominium* that would have disregarded the interests of European countries and which he attempted to avert through repeated warnings in public and in private.

Lastly, his resolve in respect of General Bollardière when the latter attempted, in 1973, to oppose a nuclear test by entering the Mururoa security zone in a sailing boat, was unanimously approved by the Armed Forces.[569] You do not get away with playing around with the centrepiece of military power in France.

In 1974, when Valéry Giscard d'Estaing donned the uniform of the head of the Armed Forces, his knowledge of the issues was limited and characterised by the tunnel vision he had

[569] Admired for his years of service and respected for his stance against the use of torture in Algeria, General Bollardière had become an out-and-out pacifist, which greatly irritated the military community.

developed during his long tenure as finance minister. He may have experienced war in a personal capacity, but he had never expressed an opinion on defence policy. His age and his modern attitude were both attractive and a cause for concern. He thus quickly sought to provide reassurance by taking part in a nuclear submarine dive and, later, by inviting the Pluton ground-based missiles to take part in the 14 July procession. The Gaullist clan was, however, suspicious of him due, primarily, to his publicly stated desire to "review our nuclear strategy". Thus, Prime Minister Jacques Chirac demanded the immediate sacking of Jean-Jacques Servan-Schreiber when the latter, who had been minister for just a few days, publicly criticised the nuclear tests.

The proven lack of appetite that the new president had for the apocalyptic nature of nuclear weapons did not prevent him from developing their capabilities in accordance with his predecessors' plans. During his seven-year term in office, the overall power of the warheads was increased threefold, and five Pluton regiments and five Mirage III E and Jaguar squadrons equipped with AN 52s were commissioned.[570]

Giscard d'Estaing had in fact quickly espoused the fundamental principles of the foreign policy of the Fifth Republic, as stated on television in March 1975: "I have arrived at the same conclusions as General de Gaulle: France is part of an alliance, but it must be able to defend itself independently. This means two things: first of all, having at our disposal the means to defend ourselves and, secondly, being the sole arbiters of the circumstances under which these means would be used". He hammered the message home the following year at IHEDN (*Institut Français des Hautes Etudes de Défense Nationale*): "France is an independent power and, strangely enough, it always has been [...]. Addressing the issue of defence nowadays [...] means taking account of these two historic concepts: France as an independent power; France as a military power". His conclusion was unequivocal: "France is and must be the third nuclear power in the world".

The President, however, did not escape accusations of deviationism. His Chief of the Defence Staff, General Méry, whom he trusted and admired, had, in March 1976, caused controversy when he mentioned the possibility of providing an "enlarged zone of sanctuary" for our European neighbours and even for the Mediterranean basin. General Poirier, the creator of the doctrine approved by General de Gaulle, had condemned this proposal, stating that, by diluting the notion of vital interests, it cast doubt on the resolve of the head of state to make use of nuclear weapons as a last resort.

As Giscard had not picked up on this concept, the debate mounted over France's participation in the "frontline battle". The President justified the position of his chief of staff, who had deemed that it was inevitable that our conventional armed forces would be engaged alongside those of France's allies in the event of an attack by the Warsaw Pact countries, explaining that "the all or nothing approach to defence risks lacking credibility". Asserting the uniformity of the battleground, without any distinction being drawn between French territory and that of

[570] General Michel Forget, *Nos armées au temps de la Vème République*, Economica, 2016.

the other Europeans, he concluded that "since there is a single space, there must be a single military corps present in that space".

The advocates of the status quo saw in this a sort of progressive return to NATO's integrated military structure and, thus, an abandonment of a national policy of independence enshrined in the 1966 decision. It is true that the 1967 Ailleret-Lemnitzer Agreements had opened the door to France's engagement side by side with our allies, and they were supplemented by the Valentin-Ferber Agreement, which was negotiated under Pompidou and signed in July 1974; it is also true that Méry had taken care to specify that France would not take up its place in the allied structure, but the very principle of accepting to fight could be perceived as a lack of faith in the effectiveness of our nuclear deterrence. Our potential subordination to NATO's supreme commander could jeopardise our freedom to take our own decisions. For Poirier, the refusal to draw a distinction between the French sphere and the European sphere was tantamount to heresy: if this were the case, where would we place the threshold above which nuclear deterrence would be used?

In order to calm tempers, Prime Minister Raymond Barre gave an outstanding speech at Camp Mailly on the principles of nuclear deterrence. Valéry Giscard d'Estaing had, in the same speech, revitalised another debate on the use of the Plutons, the Mirages III Es and the Jaguars: "Tactical nuclear weapons are not only a deterrent, but also a means of waging war". This assertion would very probably not have shocked either General de Gaulle or Georges Pompidou, especially as it recalled the fact that the decision to use such weapons remained in the hands of the head of state, but it did not comply with the official doctrine. General Méry therefore had to specify in 1977 that the use of tactical nuclear weapons constituted a "last and solemn warning". But an opening had been created for the deployment of the army.

During my staff training in Saumur in 1974, I had been struck by the ambiguities in the concept presented to us. After an animated discussion with the lecturer, during which I had declared that our doctrine was not clearly distinguishable from the "flexible response" advocated by our allies, I was summoned by the school's commander, who was very sorry to hear that an officer with good marks had called into question a doctrine that was a real catechism. As the General had refuted the idea of the flexible response because it signified the potential destruction of the European continent, France's doctrine could not be subsumed within this approach. But, despite this, a few years later, when I was a trainee at the Military Academy, I discovered that the manoeuvres of the armed forces were designed to exploit the tactical nuclear strikes concentrated on the enemy's main forces.

One of the biggest merits of Giscard d'Estaing was to have understood that the credibility of our deterrence was not limited to the quality of our nuclear weapons. Without powerful and modern conventional forces, capable of acting under the nuclear threshold and prior to any potential strike, France's determination to defend itself, including to make the supreme sacrifice, would be a subject of debate both for the attacker and for the French population.

The crisis of the *comité des soldats* and the *Appel des Cents* prompted him to make a significant financial investment, which, without sacrificing the development of our nuclear capabilities, allowed for our conventional forces to be rebuilt.

After his loss in the presidential election, when tongues started to wag and he published his memoirs, we found out that he would have been reluctant to use nuclear weapons, and that he did not intend to use them against a power that did not have the same capabilities. He thus clearly showed himself to be in favour of the non-use of nuclear weapons as a first option, which was absolute heresy in terms of the deterrence of the weak against the strong. In short, this president, who had continued to develop our arsenal and restored pride to our armed forces, the man from Kolwezi, who had so often, for better and sometimes for worse, showed his independence in respect of our allies, had this weakness that the circumstances and his statesmanship had prevented our enemies from exploiting. "This young man is unaware that history is tragic," Raymond Aron is said to have uttered after reading his memoirs.[571] However, he rightly declared in 1981 that the military power of France had never been so great.

As we know, the election of François Mitterrand caused a huge stir in French society. The military leaders were greatly concerned. I was well-placed to see this at the *Service d'information et de relations publiques des armées* (Information and Public Relations Department of the Armed Forces). The generals had convinced themselves that the France of the Fifth Republic could only be run by the heirs to General de Gaulle. No other foreign and defence policy was conceivable in their eyes. However, although his patriotism was not doubted, the new president had belatedly espoused the nuclear deterrence that he had mocked for so long. He had also criticised France when it left NATO's military structure. During the Cold War, finally, he appointed communist ministers to the government and no-one was unaware of the existence of a strong pacifist and anti-military current within the socialist party. The press, with which I had close ties, also relayed the concerns of certain socialist leaders, who feared an attempted military coup.

It took François Mitterrand less than one month to reassure the military and to secure their unfailing loyalty. By appointing Hernu, who was liked by all, as Defence Minister, flanked by two respected generals (Jacques Mitterrand and Jean Saulnier), who had both been in command of the strategic air forces, and by maintaining all the chiefs-of-staff in their posts, he provided clear guarantees of continuity. His initial declarations dispelled any ambiguities. After his visit to the Île Longue base on 24 July 1981, he declared to the press: "In 1977, we decided to develop France's deterrent for a clear reason: i.e. our position of twenty years ago could not be maintained insofar as, deprived of a nuclear capability, there would be no national defence possible and we advocate national defence, i.e. we are in favour of our national independence". A few months later, in his New Year speech to the armed forces, he stated: "It is a constant concern of the President of the Republic that the security of France is

[571] François d'Orcival, *Le Roman de l'Élysée*, Éditions du Rocher, 2007.

guaranteed, its essential interests protected and, even in extreme circumstances, its freedom to take decisions maintained".

Paradoxically, this "President that did not like war"[572] was to be the president who most often deployed our forces to external conflicts, as well as the president who gave the most thought to his personal opinion of nuclear deterrence.

Seeing himself as "the heir to a thousand years of history", he naturally positioned himself at the centre of deterrence: "The centrepiece of France's deterrence is the head of state, it is me: everything depends on his decision".[573]

The Jupiter Command Post, the underground bunker at the Élysée built by President Lebrun in 1937 to act as an air-raid shelter, had been converted by Valéry Giscard d'Estaing into an HQ. Its highly sophisticated and highly encrypted means of transmission enabled the head of state to have direct video and audio exchanges with the main actors in the nuclear chain of command. Thus, in the event of a strike order, there was no doubt as to who was the decision-maker. In order to establish his legitimacy, François Mitterrand had himself filmed in the bunker. He subsequently took part in two nuclear exercises organised by the Chief of the Defence Staff. He also used it during the Gulf War to convene the members of the restricted cabinet.

At that time, there was a secretive and mysterious atmosphere surrounding the chain of command. A short time after having been appointed as the head of the newspaper *Le Monde*, Jacques Fauvet was invited to go on board an SSBN. As technical questions were of no interest to him, he immediately suggested that they sit down in front of the TV to watch a Five Nations rugby tournament match. "First," he said, however, "I would like to see THE KEY!"[574]

Mitterrand's approach, which drew to a great extent on the work of Poirier and Gallois, was founded on a few key ideas. First, the central importance of the strike force: "France's strategy is based on deterrence, nuclear deterrence. Everything centres around this strategy. All of France's armed forces contribute to this deterrence," he declared in 1986. Followed by the principle of the apocalypse: nuclear weapons are and must remain weapons that are not used. This means, on the one hand, that they cannot be used on the battlefield and, secondly, that they must be perfectly credible in deterring any attacker. Lastly, the sanctuarisation of the national territory: this was embodied, in his mind, by the Plateau d'Albion. This site, where stationary and powerful intercontinental missiles were stationed, would always be the priority target of an enemy determined to destroy France. Its destruction would lead to a lightning response by the nuclear submarines and any other available means.

The definition and implementation of these key ideas only came progressively; in part because, as Hubert Védrine said, he hated "imposing his will in an authoritarian manner on

[572] Alexandra Schwartzbrod, *Le Président qui n'aimait pas la guerre : dans les coulisses du pouvoir militaire 1981-1995*, Plon, 1995.

[573] Television interview, November 1983.

[574] Personal secret divulged by one of the players.

puzzled defence ministers and Chiefs of Staff",[575] but also for circumstantial reasons, and due to world crises, German fears and two periods of political cohabitation. As deep-rooted as his conversion to the doctrine of deterrence may have been, it could not erase the pragmatic reflexes of an old political hand for whom, at the end of the day, nothing beats the balance of power. This is exemplified by this attitude during the Euromissiles crisis. In 1978, the Soviets had started to deploy its SS20s with a range of 5,000km, capable of striking NATO military objectives from the USSR. As the Allies did not have the same capabilities in Europe, a strategic decoupling from the United States became possible. In 1979, NATO had thus threatened to deploy American SuperPershing missiles in Europe if the SS20s were not withdrawn. Three years later, noting that the Soviets were continuing to station missiles, the Alliance decided to deploy the Pershings. Stoked by Moscow, a huge pacifist, anti-nuclear and communist movement grew up, in particular in Germany and the Nordic countries. The attitude of France, which jealously guarded its independence, was to be decisive. François Mitterrand did not hesitate: "Our analysis and our conviction, that of France, are that nuclear weapons, whether we like it or not, are still the guarantor of peace provided that there is a balance of power [...]. Maintaining this balance implies, in my eyes, that entire regions of Europe are not stripped of their means of defending themselves against nuclear weapons that are specifically pointed at them," he declared to the Bundestag in January 1983. In the following October, he said during a speech in Brussels: "I am also against the Euromissiles, but I can see that the pacifists are in the West and the Euromissiles in the East". This stance strengthened his credibility with the Allies, as well as with the French armed forces, which were reassured by his resolve. It is nonetheless puzzling that his concern for the balance of power caused him to defend *de facto* the allied concept of the flexible response, which he did not approve of any more than the General.

In September of the same year, he reiterated the Gaullist *credo* before the United Nations General Assembly: "My country is independent. Its deterrence obeys only the commands of the President of the Republic. Its loyalty to the Atlantic Alliance does not undermine its autonomy". This declaration was not purely for form's sake. Indeed, the Americans and the Soviets had commenced negotiations in Geneva designed to balance and reduce the number of nuclear delivery systems deployed in Europe (Intermediate Nuclear Forces) and the Russians were insisting that French and British weapons be taken into account in the calculations. For Mitterrand, this would have been to negate national independence. He therefore drafted Margaret Thatcher into a crusade against this project. Their joint pressure convinced Reagan to turn down the Soviet offer. In respect of France's tactical nuclear weapons, its positions changed over the course of the years until all land missiles had been removed.

It is true that the latter worried the German government, as the short range of the Plutons (120km) implied that they could target the territory of West Germany. Their replacement by the Hadès in 1991 still did not satisfy Berlin, as their range (480km) would not be sufficient to

[575] Hubert Védrine, *Les Mondes de François Mitterrand : à l'Élysée, 1981-1995*, Fayard, 1996.

save East Germany. In 1984, Mitterrand, who was sensitive to these arguments, renamed the tactical nuclear weapons "pre-strategic" weapons. In 1988, he stated: "My concern about the Hadès relates to West Germany. This country, which is our ally, needs to know that it will not be the target of the final warning that we would have to issue if a threat of war forced us to do so [...]. If I contest the 'flexible strategy' of NATO, I cannot accept the same for France. In the event of an attack against us, there will only be one nuclear warning and its objective could only be military in nature".[576] The Germans thus asked to be consulted before any use of these weapons. The French president accepted this in principle after a great deal of hesitation, but rejected the idea of joint decision-making, which would call into question France's national independence. When he learnt that General Saulnier, Chief of the Defence Staff, had had discussions with his German counterpart on this topic, he called him to order. After the fall of the Berlin Wall, the target of the Hadès programme was reduced from 180 to 30 mothballed missiles. This was how the issue of land-based tactical nuclear weapons was solved. Intended as an ultimate warning rather than for the battlefield, they were not designed, in the mind of the head of state, to act as a launch pad to counter an offensive by the first army.

With Mitterrand, however, nothing was ever simple. In 1981, he had authorised studies of the neutron bomb, the reduced collateral effects of which would facilitate their use on the battlefield. For a long time, he reserved the right to develop these weapons – "Why not if it helps our defence?"[577] – before renouncing this plan definitively.

The first period of political cohabitation with Jacques Chirac between 1986 and 1988 gave him the opportunity to assert his undivided authority on the issue of deterrence, and to define precisely the role that he wished to assign to the Plateau d'Albion. Prodded by André Giraud, his enterprising defence minister, and in an attempt to assert his role in the sphere reserved for the head of state, the Prime Minister had written into the draft Military Programme Law that the stationary delivery systems would be replaced by mobile S45 missiles. As they could be dispersed in the event of a crisis, they would put an end to the acknowledged vulnerability of the site. The draft was not new and had been pushed for six years by the Staff, the *Commissariat à l'énergie atomique* (French Alternative Energies and Atomic Energy Commission) (CEA) and the *Délégation générale pour l'armament* (General Directorate for Armament) (DGA). The President had not opposed the continuation of the studies but, in 1986, he contested the principle that these Euromissiles should be mobile: "This format already appears out-dated". He added two years later: "The surface area of France is not such that we would benefit from this". He shelved the project definitively in October 1988: "An attack on Albion would mean that we were already at war, a nuclear war. Our strategic forces would thereby be engaged instantaneously. We wouldn't have time to philosophise".

As highlighted by Jean Guisnel and Bruno Tertrais,[578] there was something irrational about this attachment to an emblematic site. The place itself, with its desolate scenery, its never-ending

[576] Interview with the newspaper *Libération*, 23 November 1988.

[577] IHEDN, October 1988.

[578] Jean Guisnel, Bruno Tertrais, *Le Président et la Bombe*, Odile Jacob, 2016.

underground corridors, and its immense silos under the surveillance of a lone young air force officer appeared to be taken straight out of a scary science fiction film. I had visited it with my class when I was at the Military School and had discovered engraved clumsily on the cork coating of a megatonnic missile an arrow-pierced heart with two interlaced initials; was this a sign of the vulnerability of the Plateau d'Albion?

During this period of political cohabitation, Mitterrand conducted, against the advice of Giraud, who saw the potential industrial benefits for France, an energetic campaign against the Strategic Defence Initiative launched by Reagan in 1983. He won over Chirac with the argument that the success of the Star Wars project would render our national deterrence obsolete. In order to retain our independence, the President denounced the unrealistic nature of the US project, which was confirmed subsequently when George Bush abandoned the project.

The collapse of the Warsaw Pact radically changed the situation in 1990. Without giving up the independence of French decision-making, as shown by his reluctance to engage French forces under American command in the Gulf War, Mitterrand strictly adhered to the concept of the "New World Order" advocated by George Bush. In this respect, he gave priority to the role of the United Nations Security Council, where France's status as a permanent member gave it the power to influence the decisions of the international community. There was no question, however, of giving up the French independent deterrence, especially as the 1968 Non-Proliferation Treaty (TNP) had recognised as nuclear powers the five members of the Security Council with vetoes. Nonetheless, the action of the President shifted towards disarmament (especially chemical disarmament) and the beginnings of a European defence force. The Balkan crises put the new world order to the test without undermining his faith in the collective action of the United Nations.

It was in this context that he decided to adopt a unilateral moratorium on nuclear testing in April 1992. The announcement of this decision was a bombshell for the armed forces, CEA and the DGA, especially as it had not been discussed in the defence cabinet meetings and it was presented by the Prime Minister rather than by the head of state. Pierre Joxe, Defence Minister, and Admiral Lanxade, Chief of the Defence Staff, attempted in vain to get the President to go back on his decision. The latter argued that the launch of the programme for the Preparation for Limitations to Nuclear Testing (PALEN) by CEA would ensure that the credibility of our deterrence would not be undermined. He merely agreed to the creation of a committee of experts headed by Lanxade in order to assess the consequences of the moratorium. When this committee advocated the temporary resumption of testing, he shelved the report.

Mitterrand's approach was particularly unexpected as no-one had forgotten the tragic and incredible Rainbow Warrior affair in 1985 when French secret services had sunk Greenpeace's boat in the port of Auckland as it was preparing for a campaign in Mururoa to oppose French nuclear tests.

The gamble he took seven years later was that all the nuclear powers would follow his example and the fight against nuclear proliferation would be facilitated. As regards the nuclear tests, his calculation turned out to be right, with the exception of China. The moratorium and the Comprehensive Nuclear-Test-Ban Treaty (CTBT) that followed did not prevent, as we know, India, Pakistan and North Korea from subsequently developing their own nuclear weapons.

In April 1993, Edouard Balladur had just taken up office when I joined the President's personal staff. As deputy for land forces reporting to General Quesnot, I was not in charge of nuclear issues, but I learnt of them at the Defence councils and restricted councils, at which I acted as secretary. At that time, François Mitterrand was already seriously ill and he would sometimes stop in mid-sentence, overcome with pain. However, his brilliant intelligence, his prodigious memory and his cutting repartee were not affected. The attempts by the Prime Minister to re-open the debate on nuclear tests got nowhere. The clash came at the Defence council meeting on 8 December 1993: "I will seek the opinion of the people if necessary,"[579] declared the President. Edouard Balladur thus realised that the armed forces would not be onside if he attempted a constitutional coup against the head of state.[580]

Having experienced this episode, I can testify to the astonishing schizophrenia that existed in certain military circles. The loyalty of the military leaders and the troops towards the Commander-in-Chief of the Armed Forces was unfailing, but in Paris, among the military staff, staff sometimes pretended to be under the orders of the Prime Minister alone, especially as Defence Minister François Léotard had no affinity with the President and did not hide this fact.

Exasperated by the criticism and annoyed by the publication of the White Paper on defence commissioned at the initiative of the Prime Minister (of which he had, however, approved the content), Mitterrand decided to convene all the civilian and military leaders of the "nucleocracy" to issue them with what appeared to be his "testament on the issue of nuclear deterrence". This meeting, which was unique in the annals of the Republic, brought together on 5 May 1994 in the reception room of the Elysée François Léotard, the highest-ranking military leaders, the directors of the CEA and its Military Applications Division, and most of the former defence ministers. The President, who had a very pale and straight face, gave a speech lasting over one hour, which he had prepared meticulously with Hubert Védrine, General Quesnot and General Vougny.[581] Aware of the polite hostility of his audience, for once he deviated little from the text of this speech. After recalling the principles of French deterrence and the exclusive competence of the head of state in this domain, he emphasised the independence of decision-making, which "excludes the possibility of it being conferred to international bodies and even to an Alliance and even to the most loyal, closest and strongest of our allies. That is why it had been decided to withdraw France from the integrated military command structure of the North Atlantic Treaty Organisation (NATO), and that is why I firmly maintain that decision". He then, for the first time ever, detailed France's nuclear arsenal. For

[579] Edouard Balladur, *Le pouvoir ne se partage pas*, Fayard, 2009.

[580] Jean Guisnel, Bruno Tertrais, *op. cit.*

[581] The air force general (2S) Vougny was his "strategic advisor" and golf partner.

the officers of his personal staff, it was clear that President Mitterrand wished to highlight the considerable build-up of our deterrent over the course of his two terms of office. He went on to denounce what he perceived as dangerous doctrinal deviations: the *Initiative de défense stratégique* (Strategic defence initiative – IDS), this "lyrical illusion", the mobile ballistic missiles, the flexible response and the "strategy of the deterrence of the strong over the mad" – the latter, according to him, did not affect our vital interests. Finally, he broached the issue that he knew everyone was expecting him to address.

> "Two years ago, I thought that the time had come for France to take the initiative to adopt a moratorium on nuclear tests, starting with its own, because the state of the world, to my mind, permitted this... It seemed to me that it was urgent to put a stop to nuclear proliferation [...]. There will be none before May 1995, i.e. in one year's time, there will not be any other tests... After me, we will not do this. We will not do this, unless nuclear powers resume their testing. We will not do this because France does not want to offend the whole world by relaunching another arms race, by hurting all of the countries that do not have nuclear weapons, by scorning the countries of the Third World and all poor countries [...]. What we need now is to develop and obtain a complete simulation system that enables us to develop the weapons that we will need between now and 2010 without nuclear tests. Since I'm not a trained engineer, I suppose that those who are, and there are many in this room, among the most competent around, must be saying: 'Typical of politicians'[...]. Well, that is the order I am giving!"

François Mitterrand concluded his speech by mentioning the possibility of a European nuclear deterrence, which was inconceivable in the near term for this pro-European: "That day has not come". Those invited to this extraordinary conference of the head of state left the room with long faces, avoiding our gazes. To tell the truth, the armed forces and his personal staff had immediate concerns to deal with, ranging from Rwanda to Bosnia, which had the effect of placing on hold their questions about the future of deterrence, but the potential resumption of the nuclear testing would undoubtedly be the topic of debate in the presidential election campaign.

The last few months of Mitterrand's presidency, which were overshadowed by his illness, the Rwandan tragedy and the ructions in the Balkans, served as a reminder of the dark atmosphere of the end of the reign of Louis XIV. Infatuated by himself, perhaps, like his illustrious predecessor, the last Republican monarch, like the Sun King, had no greater priority than the glory of this country. The independence of France and its role in the world, which were, in his mind, inseparable from its nuclear deterrence, had always guided his actions. The great hopes born at the end of the Cold War, the surprise of German reunification and the implosion of Yugoslavia inspired him, in his twilight, to make choices that were sometimes contested, but which were not definitive. It would be the task of his successor to adapt the ways and means of achieving our country's independence to the new strategic situation.

The unexpected election of Jacques Chirac, whose appetite for military issues was well known, was welcomed with joy among the ranks of the armed forces. Among the upper ranks of the armed forces, who had learnt to work with Balladur's team and who were worried about the future of military service, we were more cautious. In any case, no one imagined that the new president could call into question the national policy of de Gaulle and Mitterrand.

In reality, as the chiefs of staff feared, the new president had a vast project in mind for the defence sector, which he had developed discreetly and mentioned little during his election campaign. After the disintegration of the Warsaw Pact, the difficulties encountered by our forces in the Gulf, in Africa and in the Balkans called for, to his mind, a root-and-branch reform of the defence structures and resources. The most urgent matter, however, was not the professionalisation of the armed forces, but the modernisation of the French nuclear forces.

"Upon my arrival at the Elysée," he explains in his memoirs, "no-one was still seriously contesting the fact that nuclear deterrence has become both an essential cornerstone of our security and an important factor contributing to world stability".

Based on this observation, Jacques Chirac imposed, in three stages, an *aggiornamento* of the French nuclear deterrence: limited resumption of nuclear tests, partial disarmament, and adaptation of the concept and the resources. I experienced these stages, live, at the Elysée

Even before his election, the mayor of Paris was convinced of the need for a new battery of underground nuclear tests at the Mururoa centre, which Mitterrand had decommissioned as a precaution. In this respect, he shared the opinion of Edouard Balladur, who based himself on the expert report submitted by Lanxade. It was nonetheless an important decision that triggered violent reactions across the world, as all the major powers had suspended their nuclear tests. Even in France, this choice could have been regarded as an unnecessary provocation.

Within two weeks of his election, he started to consult personalities from diverse backgrounds. The man who persuaded him to take the plunge was his friend Robert Dautray, a former high commissioner to the Energy Commission and one of the designers of the H bomb as head of the Military Applications Division. As the moratorium had been imposed without notice, the executives at CEA were of the opinion that their experts did not have sufficient data to simulate the operation of their future nuclear warheads and thus guarantee their reliability.

The President convened in early June a restricted Defence council meeting at the Jupiter Command Post, which was attended by the executives of CEA and Hubert Curien, a former Socialist research minister. "All, without exception, expressed their approval," he would write later. On 13 June 1995, he announced on television a limited resumption of the nuclear tests, after which the Mururoa centre would be decommissioned. Chirac expected virulent criticism and almost enjoyed it, as he was not unhappy to adopt a de Gaullist stance: "All that concerns me is what must be done in the interests of France". However, the outbursts of the international media and the aggressive stance of many governments that were "friends and

allies of France" surprised him. The besieged embassies, the boycotts of French products and the hostile demonstrations whenever he travelled abroad cut no ice with him and never tested his resolve. He was merely annoyed with the negligence of his advisers and ministers, who had omitted to remind him that the resumption of the tests would coincide with the commemoration of the 50th anniversary of Hiroshima and the second anniversary of the sinking of the *Rainbow Warrior*. When Greenpeace announced its intention to occupy the Mururoa centre, he set up a task force at the Elysée to directly manage the interventions of the navy and communication. On 5 September, the first controlled explosion was conducted, and Chirac even invited the International Atomic Energy Agency (IAEA) to oversee the safety of the local populations.

On 29 January 1996, after six tests, CEA was of the opinion that its objectives had been achieved, and so decided to end the test campaign and commence the second stage of the *aggiornamento* of the deterrent – the partial disarmament of our nuclear capabilities.

The second half of 1995 had seen the Defence Ministry under pressure. Not content with the offensive in Bosnia and challenging the conclusions of the 1994 White Paper on the semi-professional "mixed armed forces", the President imposed an uncompromising review of our nuclear forces on reluctant chiefs of staff. No-one disputed his power to be the sole arbiter of the required level of our means of deterrence, but the sacrifices required clashed with the convictions and the interests of those who thought that the legacy of François Mitterrand would remain intact. His decision to close the Plateau d'Albion surprised no-one, as he had so often criticised the vulnerability of the site while he was prime minister. To those who objected to losing the "sanctuarisation" of the national territory, he replied that it was time to abandon the Cold War rhetoric. The destruction of the Hadès missiles excluded the land forces henceforth from the nuclear club, but he warned his chief of staff against the parochialism that was damaging to the general interest. The reduction in the number of SSBNs from six to four gave the navy the impression that there was a risk of compromising its permanence at sea, but he denounced the manipulation of the figures. The decommissioning of Mururoa worried those, of whom there were many, who feared that the test simulation, which was based on a scientific gamble, would remain an illusion. Enlightened minds like Alain Devaquet and even a future atomic energy high commissioner did not hide their doubts in private. The head of state did not care, as he was convinced that the reliability of our nuclear weapons was guaranteed for the future and that the independence and survival of the nation were guaranteed by the 450 nuclear warheads in the new arsenal. Chirac went even further and committed to signing and ratifying the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which had just been drafted. Finally, he decided to completely stop the national production of fissile materials for nuclear weapons, a measure that was mentioned on several occasions in the discussions between the five powers that were signatories to the NPT, but never adopted.

Thus, France, the troublemaker on the international stage, criticised by the prophets of pacifism and the moral authorities on non-violence, became a pioneering nation in the field

of nuclear disarmament. This change of stance went fairly unnoticed, so entrenched was the prejudice. It was noticed even less since France was abolishing its military service at the same time, which unsettled our European neighbours, especially Germany. Lastly, and above all, Chirac reasserted, in the new Military Programme Law, the central role of deterrence in the national strategy, which could not satisfy the opponents of the nuclear deterrence.

Having imposed on his ministers, his military chiefs and parliament an upheaval of defence structures and resources, which they did not want, the President did not want to run the risk of prolonging the debate. He thus renounced drafting a new white paper and limited himself to defining the objectives of the reform in a report appended to the 1997-2002 programming law. This text reflected indisputable continuity: “Since the start of the Fifth Republic, France’s defence policy has combined strategic independence and respect for solidarities [...]. Deterrence is still the cornerstone of France’s defence strategy”. It also mentioned the need to “protect our power interests with an awareness of our responsibilities across the world as a permanent member of the Security Council and possessing nuclear weapons”. The break thus related above all to resources: “strict sufficiency” downgraded for nuclear forces and professional armed forces oriented as a matter of priority towards external affairs. Two aspects, however, suggested a new policy approach that differed from de Gaulle’s dogma of national independence: the assertion of France’s wish to participate in the reform of NATO and the desire to endow our country’s policy with a “European dimension”. On this point, the proposal made to our partners to develop a “joint deterrent” shocked those who advocated an orthodox approach. We know what happened to these two “overtures”. Chirac, who learnt the lessons from NATO’s involvement in the Balkans – ushered in by Mitterrand – negotiated over the course of a year the conditions of France’s return to NATO’s integrated military structure. American demands quickly got the better of his rather unassertive attempts, and this I can bear witness to. As regards the “joint deterrent”, it was met with deathly silence by our European partners.

The third stage of the *aggiornamento* was implemented just after I had taken up my post as personal Chief of Staff to the President. Cohabitation in the highest echelons of the state had reached cruising speed, and the deployment of our forces to the Kosovo conflict did not trigger any tensions between the two banks of the river Seine. Alerted by Jean-Claude Mallet, Secretary General of National Defence, Louis Gautier, Defence adviser to Lionel Jospin, and myself were well aware of the threats to our deterrence in early 1999. The traditional balance between the great powers was disrupted by the emergence of new regional players equipped with nuclear weapons and medium-range missiles. India and Pakistan had carried out tests in 1998; other countries, such as Iran, had secret programmes and also had chemical weapons that could be fitted to their missiles.

However, to face up to these new threats, the United States developed an antimissile defence programme, which was less ambitious than Reagan’s Star Wars programme, but scientifically more credible, which could, according to Washington, ultimately replace nuclear deterrence. This American project was given a warm welcome by most European governments, but was a

concern for Russia and France, which feared that their deterrence and, consequently, their strategic independence would be jeopardised.

Based on our proposal, the President and the Prime Minister set up a think tank to examine the concept and the means of our deterrence, the work of which was to be validated every quarter by the Defence council.

At the start of 2001, Chirac, in full agreement with Jospin, approved a major change of doctrine. The apocalyptic “anti-cities” strategy in force since the inception of the strike force was abandoned for the regional powers threatening our vital interests. The latter, in the event of a huge attack, would no longer risk having their cities destroyed, but all their power, political, military and economic hubs. The capabilities of our nuclear forces would therefore need to be adapted accordingly.

I had to explain this to Paul Wolfowitz, adviser to George Bush, when he was in Paris. When he declared to me that, if Marseille were to be hit by an Iranian chemical weapon, our deterrence would be powerless, as a threat of the vitrification of Iran would not be credible, I explained to him our new concept, which left him astonished.

This major development was presented on 8 June 2001 by the President at IHEDN, but got lost in the hubbub of cohabitation. He then further explained this approach in January at Île Longue. The break with the doctrine of François Mitterrand ran deep, as the former president would have condemned the creation of less powerful and more precise weapons, i.e. weapons that were more likely to be used. In reality, Chirac, like his predecessor, rejected the notion of miniaturised weapons that could be used on the battlefield and he knew that, in the post-Cold War context, the mere threat of a nuclear strike would have dire consequences that exceed all calculations and speculation. The only thing that counted for him was the credibility of the French nuclear deterrence, which was the bulwark against war and the cornerstone of our freedom of action, especially in the event of being blackmailed by a regional power. It was also to prevent this type of threat that he resumed work on the final warning that could be sent, not to military objectives, but unpopulated regions, or even in the form of an electromagnetic pulse.

It was my responsibility, in my capacity as Chief of the Defence Staff, to implement the programme to adapt our forces. As I was aware of the importance of this reform, in parallel I wanted the new concept to be taught in our training schools, but without much success. Jacques Chirac had thus shaken the foundations of our military power. However, he was unable to allocate all the resources that such a change entailed. Defence was not a priority for Lionel Jospin, who controlled the budget; and, after 2002, the increase in the military appropriations was insufficient to break down the financial wall created by continuously spreading the resources across the programmes. At least the main projects to modernise our nuclear forces and simulation projects were implemented without too much delay.

The strategic independence of France was in no way affected by the birth of a European defence system following the Saint-Malo Summit in December 1998. It even contributed to its freedom of action by providing it with alternative options.

The 2003 Iraq War demonstrated, if there were any need, the independence of our country. Its uncompromising opposition to the planned US-British invasion was only possible because its status as a nuclear power allowed it to do so. No other government, including Russia, which was in the throes of establishing closer ties with Washington, opposed as clearly and forcefully this initiative and its disastrous consequences. Condy Rice understood that and advised George W. Bush to "forgive Russia, to forget Germany and to punish France". "French bashing" in the United States became a national sport and bilateral relations suffered until Chirac left power.

During the 2002 presidential election campaign, he had said to me: "I have always thought that military power is an important asset for France. It is this power that enables it to play its role and maintain its standing on the global stage".

Nicolas Sarkozy was the first French president to have no personal experience of war. His military service in a barracks in Paris, where he performed ancillary tasks, did not leave an unforgettable mark on him. Even more so than Valéry Giscard d'Estaing, he had a financial and accounting approach to defence, inspired by his time as finance minister.

Having met him twice when he was a minister under Chirac, I had been confronted with his scepticism towards the deterrent, which he regarded as a relic of the Cold War. Once elected, however, he unreservedly shouldered his supreme responsibility as Commander-in-Chief of the Armed Forces. General Georgelin, who was then Chief of the Defence Staff, witnessed this awareness of his responsibilities when he presented the nuclear planning to him in the first few hours following his inauguration: "I was struck by how the President listened religiously". He even mentioned his "transfiguration": "He was in another place, if I can put it that way, at another level".[582]

The "conversion" of Sarkozy was reflected in his speech of 21 March 2008 in Cherbourg before the publication of the White Paper, the drafting of which had been entrusted to Jean-Claude Mallet. To the great relief of experts in this area, he announced that both components of the French deterrent would be kept, even though the commissioning of the ASMPA missile (enhanced medium-range air-to-ground missile), which was more effective than its predecessor, enabled him to abolish one of the three squadrons of the strategic air force. In the name of the principle of strict sufficiency, the number of commissioned nuclear warheads was now below 300. Lastly, a fact that is rarely mentioned, the change in doctrine implemented by Chirac was followed through to its completion. The anti-cities strategy ("unacceptable damage of any kind") was officially abandoned, which should have reassured the moral authorities so attached to the principles of the "just war" (proportionality and protection of non-combatants). Regardless of the attacker, the potential targets of a nuclear

[582] Jean Guisnel, Bruno Tertrais, *op. cit.*

strike would be limited from now on to its "power hubs". The White Paper, published a few weeks later, confirmed the continuity of our external policy. In his opening words, the President emphasised the following: "I have two objectives: that our country remains a major military and diplomatic power, in a position to shoulder the challenges conferred upon us under our international obligations and that the State guarantees the independence of France and the protection of all French citizens".

It is true that, in this document covering security problems as a whole, nuclear deterrence was no longer seen as the centrepiece of the system, but it was still "an essential cornerstone of France's strategy... the ultimate guarantee of national security and independence [...], one of the conditions of our strategic independence, as well as of the freedom of the Head of State to make his own judgements and take his own decisions and action".

The return to NATO's integrated military structure, decided in the same year, did, however, constitute a real break with the line adopted by de Gaulle and Mitterrand and could be regarded as the *de facto* relinquishment of an independent policy. That is why Sarkozy underscored his refusal to rejoin the Nuclear Planning Group: "We can have a dialogue on deterrence, we must have a dialogue on disarmament, but the decision-making cannot be shared".[583]

It is against this background that the large-scale offensive against nuclear weapons was launched by the Global Zero movement and backed up by President Obama's Prague speech in 2009. The international campaign for a "world without nuclear weapons" was obviously an attractive one. Sarkozy reacted to this outpouring of good intentions and utopian proposals, which called into question once again the continuity of our deterrence, by taking two initiatives. The first, based on the progress made by Chirac in this field, entailed launching a call for specific nuclear disarmament measures (signature and ratification of the CTBT, decommissioning of the test centres and cessation of the production of fissile materials for nuclear weapons). He secured endorsement for this call from the European Union during the French presidency.

The second entailed the signature of the Lancaster House Agreements with the United Kingdom in 2010. This bilateral cooperation agreement, which comprises a traditional military section and a nuclear section, embodied the two nations' desire to remain among the leading global powers. It was also a means for France to ensure that the British would not abandon their nuclear deterrence, which had been the subject of many debates across the English Channel, as this would have considerably weakened France's position. One of the objectives of the treaty was also for both countries "to guarantee the viability and security of their national deterrence".

At the same time, Nicolas Sarkozy, along with his British counterpart, was embarking on a "humanitarian" campaign in Libya, whilst also making significant cuts to army personnel. The

[583] École Militaire, 11 March 2009.

global financial crisis got the better of the Military Programme Law and the future of our conventional and nuclear forces was becoming increasingly uncertain.

François Hollande had not earmarked defence as a major priority during his presidential campaign. He had nonetheless devoted a long article to this in the *Nouvel Observateur* under the explicit title: "I will keep it (*Je maintiendrai*)",[584] in which he emphasised his attachment to both components of the French nuclear deterrence, which he described as "our country's life insurance policy".

Two months after his election, he took part in a dive on board the nuclear submarine *Le Terrible*. However, it became clear to him very quickly that the changing international context, the upheavals of the Arab Spring, the return of France to NATO's military structure and, especially, the state of public finances meant that our defence and security policy required updating. The White Paper, which he approved in September 2013, continued and furthered the changes made during the previous five-year presidential term. In his preface, François Hollande no longer mentioned national independence. At most, he mentioned that France "acts in close cooperation with its European partners and its allies, but maintains its own capacity for initiative". The text of the White Paper did recall that "nuclear deterrence is the ultimate guarantee of our sovereignty" and that "the maintenance of our strategic independence, guarantor of our freedom to decide and act, is the main principle underpinning our strategy", but the emphasis was placed on the "freely chosen interdependencies" with our partners. Deterrence, which "prevents any threat of blackmail", seemed to blend into the five main strategic functions.

We had to wait for the traditional "keynote nuclear speech" of the President of the Fifth Republic to see Hollande refer unequivocally, on 19 February 2015 in Istres, to the fundamentals: "What the deterrent force permits is to ensure that a nation, that France, that your country, has what is most valuable, most precious, most vital, which is its independence". "We all know," he said, "that when France speaks, it can act. And the forces of its deterrent serve to ensure that the international commitments of France will always be honoured, even if the use of nuclear weapons is only conceivable in extreme circumstances of legitimate defence".

These declarations, which were made in the wake of the first terrorist attacks on national territory, put an end to speculation by those who were hoping for a review of our nuclear position. It is true that the use of chemical weapons in Syria, the persistent uncertainties about Iran's programme and the nuclear tests in North Korea should have tempered their demands.

A few weeks before the end of his term of office, building on Sarkozy's initiative, the President proposed a draft treaty banning the production of fissile materials for nuclear weapons. In spring 2017, everyone knew that the future of our deterrence would depend on the next Military Programme Law, with the expected renewal of all of its components and the resulting additional budgetary cost. The Chief of the Defence Staff kicked off the campaign on the topic

[584] Guisnel et Tertrais, *op. cit.*

of the 2% of gross domestic product that France, like its allies, had committed to allocate to its defence appropriations.

Emmanuel Macron, imbued, like Giscard and Sarkozy, with the financial and accounting approach to the issues affecting the Ministry of the Armed Forces, was to be the first President of the Fifth Republic not to have done his military service. His publicised confrontation with General de Villiers on appropriation cancellations could have been interpreted as suggesting that he wanted to break with France's traditional policy, especially as his keynote speech on Europe at the Sorbonne called for a "European sovereignty", which is difficult to square with a national deterrence.

On 23 January 2018, in his New Year's speech to the Armed Forces, he issued a clear, substantial and reasoned message that was completely in line with the legacy handed down by de Gaulle and Mitterrand: "I want a strong France, which is the master of its own destiny, which protects its own citizens and interests, which is capable of ensuring its own defence and security and, at the same time, capable of offering global responses to the crises affecting us [...]. Firstly, nuclear deterrence. For the last 50 years, it has been the cornerstone of our defence strategy [...]. I am convinced that the relevance of our deterrence model, based on strict sufficiency, should remain. It is this model that enables us to maintain our strategic independence and our freedom of action under any circumstances." To conclude, he added: "What must guide us is the rightful place of France in the concert of nations".

In July 2017, the United Nations General Assembly adopted a draft Treaty on the Prohibition of Nuclear Weapons. This vague text, which is impossible to implement as it contains no control measures, and which was ignored by all of the nuclear powers, is not a forerunner to the end of nuclear deterrence. This approach, intended to pressure governments through public opinion, got little attention in our country despite the Nobel Peace Prize being awarded to a group of NGOs that advocated it.

One would have to be very naive and act in bad faith to ignore the fundamental role played by nuclear deterrence in maintaining peace and stability since the Second World War, and one would have to be blind to think that such treaties can effectively combat the dangers of proliferation. The vast majority of the French people want to keep this central plank of our defence policy. As a disillusioned American Global Zero activist said to me: "France will be the last country to give up its nuclear weapons, as its status and independence, in its eyes, depend on them".

*4.2.3. Jean-Claude Mallet **

I was asked to talk about national independence and nuclear deterrence. This is what I am going to try to illustrate by recalling our current situation compared to when the deterrent adventure was launched at the start of the Fifth Republic. Initially, deterrence, as perceived by General de Gaulle – which was not yet called deterrence – became this essential pillar of our strategy. It is a question that was regularly debated at that time. But these debates were not set in stone and, fortunately, the strategy has been adapted over the decades. If I had a more personal testimony to give you, it would indeed relate to this adaptation phase, in particular between 1990 and 2000.

At the start of this adventure, the main concern of General de Gaulle, if you look at his writings and declarations, was simply for France to possess all weapons of power. When he spoke at the Military School at the start of the Fifth Republic, and at the start of his term in office, possessing all weapons also included having nuclear weapons. His reasoning was fairly straightforward. It was not yet a reasoning based on the strategy of the weak against the strong. The theorising of this approach was to come later with Poirier and the 1972 White Paper, with the French school of thought on nuclear deterrence, which is a very special, specific school of thought, which already displayed independence. It was therefore about having all weapons: "I want to have all weapons of power because, today, there are weapons of destruction that can be so powerful that there is no other weapon that can resist this military capability and, I, as a political leader, head of the government firstly, and also head of state, want France to possess them, I want France to possess them because if it doesn't, it will not be independent". The approach is clear: possessing nuclear weapons is essential because French armed forces need maximum firepower and France must never be in a position where its independence and sovereignty can be threatened. General de Gaulle took the decision to equip our armed forces with this capability because it is absolutely essential. It is part of the panoply of the great powers. "If I don't have it, I will be exposed to blackmail by the great powers." That was the starting point.

It was the political powers that were to impose this capability, including on the armed forces. In his contribution, Admiral Coriolis described a world, which is today's world, but which is the result of efforts that have been imposed on the country. Decisions relating to Île Longue and the launch of work on strategic missiles had to be taken. There were few people back then; there was a small office at the *Délégation générale pour l'armement* (General Directorate for Armament), which was working on the designs in order to devise how we were going to build the future missiles – not to mention the Military Applications Division of CEA, which could say even more about this. From its inception as something of very small scale, it has become an industry, which has been described by the other contributors to this chapter. The result presented by Admiral Coriolis is the fruit of many years of financial investment and human and technological resources allocated by the nation. These efforts enabled this deterrent to be developed in just a few years. This was the foundation of the Fifth Republic; i.e. according

to the conception of the President of the Republic, Charles de Gaulle, there is an extremely close link between the independence that he wished to give the country and the independence of his foreign policy. There is therefore a link between the deterrence capability and the independence of foreign policy and also, of course, the tenets of his defence policy.

It was in fact after the departure of General de Gaulle, in the 1972 White Paper, that the theory of deterrence was defined. This theory was back then expressed as the theory of the weak against the strong; i.e. possessing a small capability to be used to stand up to any state due to the destructive power of any nuclear weapon. At that time, in 1972, along with a small group of drafters, the Defence Minister, Michel Debré, developed the full theory of France's nuclear deterrence and defence strategy, which ranges from nuclear weapons through to conscripted or volunteer soldiers. The description of the 1972 White Paper above is phenomenal. It also describes the manoeuvres of all French forces when faced with an enemy, which was not specifically designated, but which was clearly the Warsaw Pact at that time. All of this thus forms a coherent whole.

All of this could have fallen apart at the end of the Cold War. There have also been attempts to call into question the choice of a nuclear deterrence. Indeed, paradoxically, it was a Socialist president, who had initially fiercely opposed nuclear deterrence before becoming president, who later became one of its biggest advocates and who would also win a number of homeric political battles. Let us recall the Euromissiles battle. It was François Mitterrand, one of the first opponents of nuclear deterrence, who espoused it under the conditions explained by Jean-Pierre Chevènement in his testimony. Mitterrand was to be one of the best advocates of the – I am tempted to say "Western" – nuclear capability, even though this is a word that would not please minister Chevènement. He was to be one of the best advocates of what deterrence was and how it could be used by France as a tool of its policy and sovereignty, including in the field of foreign policy. This meant maximum independence, the ability to create this tool, to operate it, manoeuvre it, as already explained in this work. This could also be described for the strategic air forces and also, of course, for anything that existed up until the withdrawal of the tactical forces, the Pluton missiles, followed by their successors, the Hadès. We therefore have this holistic approach, this vision of independence and the foreign policy attached to this independence.

Obviously, when the Soviet bloc exploded, when the Soviet Union collapsed, when there was a complete change to the world order in the 1990s with the fall of the Berlin Wall, the following question arose: is nuclear deterrence, as theorised in 1972, still relevant? It was François Mitterrand who would steer the initial expression of France's new defence doctrine after the fall of the Berlin Wall in the 1994 White Paper during a period of political cohabitation. It is quite strange to see, when we take a step back, that the two significant periods of cohabitation were fairly productive in terms of the development of the French deterrence policy, first in 1994, when the post-Cold War theory was needed, and then, a little later, with Jacques Chirac, when it was necessary to take account of the fact that we were no longer faced with a Soviet bloc, no longer in a face-to-face confrontation between two blocs that structure all

international power relations; we were in a different situation. We are no longer necessarily and exclusively in a relationship of the weak against the strong, which is driving the deterrent. But we have what has been modestly described as more diverse scenarios and threats. The risk of proliferation and other types of relevant deterrence will have to be taken into account. And this is where we are now.

The work that was started so cautiously by President Mitterrand, and developed far more "boldly" by President Chirac, has led to a progressive modification of the discourse on deterrence and the qualities, capabilities and characteristics expected operationally of nuclear weapons and their management. I have mentioned earlier the deterrence of the weak against the strong; at that time, we were confronted by a bloc. We thus had a massive capability. This capability remains to this day. Nonetheless, we have been forced – and we have theorised this – to modify the different types of planning that we have for our nuclear weapons, so as to adapt to a system in which we are no longer in a face-to-face confrontation between two blocs with a completely predetermined enemy. Instead, we are faced with undetermined situations, uncertainty about the type of enemy and a greater variety of the types of threats likely to affect the national territory, the French population or the heart of the functioning of the Republic. We have been fortunate enough to have successive presidents of the Republic that have been bold enough to express their vision.

We can say that this has been both an extremely meticulous task in order to analyse how the text and the language of deterrence could be modified in order to adapt the French deterrence. I think it is a fairly important piece of work for the experts, for dialogue between states, for dialogue on deterrence. This is also very important for relations with the parliament. It is essential for there to be a dialogue between the executive and the parliamentary representation in order to consolidate, on a permanent basis, the relationship between the authority that owns the nuclear weapon and the country. This entails dialogue with the parliament and action by the parliament, which votes through the appropriations and the renewal projects, which are also mentioned by Jean-Pierre Chevènement and Admiral Coriolis in their contributions.

What could change today? Given that we are no longer threatened by "the thunder clap in the blue sky", i.e. specifically by a shower of Soviet missiles launched against the countries of the Atlantic Alliance, what has changed? One of the important points in the most recent texts, to which I refer readers, is the need for France to be in a position to resist any blackmail.[585] We mentioned the "interdiction capacity". The freedom afforded by nuclear deterrence is the freedom of judgement and decision-making freedom, which is in part linked to possession of nuclear weapons. In this respect, I think that there is broad consensus on the left/right of the French political spectrum, at least in my experience. Two-thirds of the Assembly at least, or three-quarters, agree with this line. No-one wants to be in a situation where a power has nuclear capabilities that could threaten us with destruction, strike at our "vital interests", as

[585] Cf. in particular, the White Papers on national defence and security of 2008 (Odile Jacob) and 2013 (La Documentation française) and the *Revue Stratégique* of 2017, La Documentation française.

the canonical texts state. We need to have the capability to resist any blackmail. This blackmailing by other states – I'm limiting myself to dialogue between states – is still, as you know, a possibility today and in the future.

Secondly, we have shifted – we talk about national independence in the title of this chapter – towards strategic independence. One of the primary principles of defence policy and of our foreign policy currently is the guarantee of strategic independence. There is a subtle difference; some would say the edge has been blunted a little, and perhaps there has been a slight deterioration because our independence, in the strictest sense of the term, and perhaps as perceived by General de Gaulle, can no longer be as radical as it was. There are a number of fields in which we cooperate, including defence. We have flexible cooperation arrangements with our European and American partners. We cooperate in a number of fields. However, we retain almost completely our core independence and autonomy. We have some leeway enabling us to retain our independent capacity of action and decision-making capacity, but it is not total across the whole spectrum of actions and operations. We have nonetheless ensured – this has been the case for the last twenty or thirty years – that our defence budget has been sufficient to maintain our strategic independence under all circumstances. Of the key factors to strategic independence – we can see that over the last thirty years –, nuclear deterrence is obviously the primary capability, which gives us this possibility to retain France's strategic independence. This capability is almost unique in Europe. It is shared by the British, but by no other European state. This is an important characteristic, which is a major asset within the framework of the construction of the European project.

The last point that I would like to emphasise is the overall "pull effect" of deterrence; Admiral Coriolis also made a reference to this in his contribution. To be able to launch a nuclear missile from the bottom of the ocean, technological capabilities and an industrial tool need to be developed, and a maintenance tool is required, as well as exceptional, specially selected human resources, which are trained and deployed day and night, 24/7, 365 days a year, at sea, in the air and on the ground, which is relevant to all the command structures, transmissions and the rest. It is quite exceptional that France has this capability. You also have to have the laboratories of the Military Applications Division of CEA, which are capable – they are the only ones in Europe, along with the British to a certain extent – of dialoguing with Livermore or any other big American laboratory, which are capable of mobilising nuclear physics and calculation resources in parallel and on mass or any other technologies that are used nowadays in nuclear weapons simulations; that are capable, using these resources – we could talk about lasers for just as long – of reproducing a number of tests that enable us to benefit from programming to renew our nuclear weapons and anything related to this programming. I mean by that not only the nuclear arms system, i.e. the nuclear weapon and its delivery system, the missile, but also its strategic environment, i.e. the aircraft, the frigates, the submarines, which are not all nuclear-powered ballistic missile submarines (SSBMs). It is this package that has a pull effect on all of our defence resources from a technological, military and human resource viewpoint. We thus have a system that is, primarily, very coherent;

secondly, it is ring-fenced in terms of defence funding; and, thirdly, it has a pull effect on our entire military capabilities.

To conclude, I draw on my own personal experience to illustrate two or three things. First, in 1994, President Mitterrand agreed to Prime Minister Edouard Balladur's request to set up a committee to draft a new White Paper, that of 1994. However, Mitterrand had issued instructions enabling the texts prepared by the committee chaired by Marceau Long to be amended; I was secretary of this committee. At the end of the day, Mitterrand amended only two passages, the one on NATO, because he had found excessively bold the few sentences that were devoted to the future development of the Atlantic Organisation and, especially, France's relationship with the organisation, and one relating to nuclear issues. The handwritten notes of President Mitterrand are in the archives of this committee, to be found at the *Conseil d'Etat*. The attachment of President Mitterrand to the language of deterrence, to what he expressed in official speeches or documents, was such that he focused his attention on these points when he approved the 1994 White Paper at the Defence council.

My other anecdote relates to the presidency of Jacques Chirac, which was key to the development of our deterrence. It was key because, in reality, he defined the format for some time to come. He abolished the land component, which he regarded as outdated, contrary to the approach of François Mitterrand, who considered that the "*crux of the deterrent*" was the Plateau d'Albion. President Chirac did two things: first, he decided to modernise our language relating to deterrence. Along with his Prime Minister Lionel Jospin, he conducted an examination (never presented to the public) that I would describe as bipartite, as it took place during a period of political cohabitation. With a small group of people – who were not all deterrence specialists – we examined in detail, in the wake of the 1994 White Paper approved by François Mitterrand, and at a time when Jacques Chirac himself was taking the decision to resume nuclear testing, whether deterrence should be retained and, at the same time, accorded the same status as in the wake of the Cold War. He conducted this examination with the help of Admiral Delaunay, his personal Chief of Staff, Hubert Védrine, who was Foreign Affairs Minister, a number of experts and civil servants, Alain Richard, who was Defence Minister and, of course, Prime Minister Lionel Jospin. The latter acted somewhat out of character in agreeing to play this game of modifying the language of deterrence, modifying the concept and, consequently, modifying a number of capabilities that we had in terms of our deterrent. He personally got involved in this venture precisely because he considered that it was necessary to modernise, adapt our capabilities and our strategy to the new strategic situation, which, as I indicated, required that we diversify our thinking on the value and relevance of using nuclear weapons. This then gave rise to instructions issued by the head of state (and repeated later by the Presidents of the Republic who succeeded him) to the Chief of the Defence Staff.

I can testify to the manner in which the nuclear tests were resumed in 1995, which illustrates quite well the involvement of the President of the Republic, pursuant to Article 5 of the Constitution, which stipulates that he is the guarantor of national independence, treaties, etc.

Indeed, the resumption of nuclear testing was decided in the bunker of the *Centre opérationnel interarmées* (Joint Operational Centre) (COIA). We were in a meeting with the then Defence Minister and the Chief of the Defence Staff, Admiral Lanxade; we were working on the relaunch of our operations in Bosnia, which was another major debating point in 1995. We were in the office of the head of the *Centre de planification et de conduite des opérations* (Joint Strategic and Command Centre) (CPCO). The telephone rang on the head of state's direct line. It was Admiral Lanxade who picked up the phone and it was Jacques Chirac on the phone. We saw the admiral slightly adjust his position on the phone. We heard him say: "Yes, *Monsieur le Président*, it will be done". Jacques Chirac had just said: "We are going to resume nuclear testing, you need to prepare a file for me in the next three days on the resumption of nuclear testing". This was just to illustrate the type of relations that could exist between political and military authorities. The decision was taken directly by the President of the Republic, addressed to the Chief of the Defence Staff, who, fortunately and by chance, was that day with his Defence Minister, who launched the machine to initiate the last battery of nuclear tests. I believe that France can be grateful to the President of the Republic for taking this decision, which enabled us to make the transition between a world with nuclear tests and a world without nuclear tests, all with a view to enabling us to retain our long-term national independence.

To conclude, I will address the issue of the credibility of nuclear deterrence. As Jean-Pierre Chevènement mentioned in his contribution, there are cases where deterrence cannot work. Nuclear deterrence is, in reality, part of a power relation between two states. It is not intended to deter limited attacks, whether targeted at the national territory or the French population. The objective is state-to-state relations and to deter an all-out war. Even more seriously, what happens if we are faced with a world in which nuclear weapons are actually used? In other words, in the event that we are faced with the onset of a nuclear war or the use of nuclear weapons. In that case, we will move quite simply into another era. In such a case, it would be better to have this capability than not. If there were a breach of the rule prohibiting the use of nuclear weapons, which up until now has been universally accepted and in respect of which all countries are positioning themselves on the international stage, we would shift into something very different. It was the main justification for the 1968 Non-Proliferation Treaty and the combat against proliferation. Why are there states with a special status? The list of countries that legally possess nuclear weapons under the 1968 treaty stopped with China, and includes the five powers that had conducted tests before 1 January 1967. This list is established due to the destabilising nature of nuclear weapons, which, if they spread, causes us to adopt a different logic. The risk is that nuclear weapons become regarded as a weapon for the battlefield and, if they are used as conventional weapons, this takes us into a new universe where there is no "plan B". We can reflect upon what these situations would be, and we can see clearly that the art of war would radically change. The strategy to be invented would be totally different and there would be a risk that several states (who have the means for that) could decide to develop nuclear weapons one after the other. The NPT and other

non-proliferation instruments, the counter-proliferation strategies set up since the 1990s, have the final goal of preventing such nightmare.

*4.2.4. Charles-Édouard de Coriolis**

I will first recall the fact that Mr Jean-Pierre Chevènement, Minister of Defence (1988-1991), was on board *L'Inflexible* submarine red team for my first patrol as head of the missile service. On that occasion, I showed him the M4 arms system and, in particular, the bottom of a missile launcher tube. I experienced this inspection as the first practical manifestation of the involvement of political authorities in nuclear deterrence matters.

What are we talking about when we refer to an SSBN (nuclear-powered ballistic missile submarine)? Symbolically, it is "the Kourou space centre, in dive mode and propelled by a nuclear reactor". This was a real feat achieved by the naval architects, who succeeded in integrating three high-technology fields, which must be coordinated when the submarines are on patrol, of course, but also during maintenance.

A leader, one mission, resources... Such is the essential triptych on which nuclear deterrence is founded.

The direct involvement of the Presidents of the Republic since General de Gaulle has reflected the continuity of government action. This commitment is reflected by presidential positions, but also by their boarding the submarines, as was the case with President Hollande and President Macron, who boarded *Le Terrible* at sea in July 2012 and in July 2017 respectively.

It highlighted the importance of the chain of command and, consequently, of the guarantee of transmission of the presidential order.

The Chief of the Navy Staff and the Admiral in command of the *Force océanique stratégique* (Strategic Oceanic Force – FOST) are accountable to the political authorities to ensure that the submarine component is in battle order and that, if the engagement order were to be given, we would be in a position to execute it under all circumstances. It is not an exercise but an operation, as there are no allies when it comes to deterrence. The Chief of the Navy Staff is also responsible for the *Force d'action navale nucléaire* (Nuclear Naval Action Force – FANU), but the organic responsibility for it was outside my remit when I was commander of the submarine forces.

I would like to start with the 16 crews of the submarine forces: six nuclear-powered nuclear attack submarines (SSNs) and four SSBNs), 2,400 submariners. The first key to our power.

An SSBN crew is characterised by its cohesion and its consented obedience to use, following a decision of the President of the Republic, this terrifying weapon. This holds for the commander, but also for the crew. In addition to this obedience, we must add the desire to accept the sacrifice of being completely disconnected from the world and our family for several weeks. Obedience and sacrifice are easy to understand in wartime, but it is more difficult to explain in peacetime and, especially, during the 1990s after the fall of the Berlin Wall, when we had to hand back the dividends of peace. It is a very technical job, which requires team work. Each person has a role to play.

A. Recruitment, training and securing loyalty

The average age of the on-board crew is 27/28 years old, with an age pyramid that resembles a chimney rather than a pyramid! There are 115 crew on board an SSBN, 75 on a Rubis and a little less on the Barracuda. The critical mass of "human resources" has been achieved, but what margin is there? I like this notion of critical mass, which is very relevant in the context of nuclear energy! This "HR critical mass" is difficult to assess except when we fall below it, as happened in 2000 when we had to close two out of the 10 SSN crews because we were short of a few nuclear physicists known as "instrumentation engineers", who are in charge of the I&C (instrumentation and control system) of the naval nuclear propulsion plant. It took the submarine forces eight years to retrain these two teams.

We run a personalised policy to welcome volunteers and convince them to undertake difficult and demanding training courses, especially as regards protecting secrets.

The very nature of the mission requires the commitment of the crews. And it is indeed the unfailing determination of our country that has allowed for the continued effort of all those involved over the years. This remarkable performance cannot be achieved without unconditional investment at all levels, from the lowest to the highest, which all derive their common commitment from the determination of the head of state. This fight for "human resources" thus contributes to our independence.

B. Invulnerability and permanence at sea

Permanence at sea is essential because it enables us to bring to bear a threat to a potential enemy at any time and in any place. It is the basis of the credibility of the system in the eyes of the enemy, both in terms of our technical capabilities and our determination. It is the dilution and mobility tandem that allows us to prevent the threat of a strike by a potential enemy.

Permanence at sea is part of the concept of invulnerability, including in the event of a strategic surprise. It thus guarantees the second-strike capability: whatever happens, we must be in a position to respond. And, since November 1989, I have witnessed a large number of such strategic surprises. If this permanence were no longer guaranteed and, in the event of a direct threat, we had to launch an SSBN from Île Longue, the safety of this launch would require significantly greater resources, as the Russians ensure around Murmansk with their "A2AD" (Anti-Access & Area Denial) bubble.

Permanence also enables politicians to retain their freedom of action, to not have to order a launch as their first order. Indeed, in the absence of permanence, an unscheduled launch of an SSBN during a crisis could be interpreted as a strategic signal that could interfere with the political message and prompt a potential enemy to try to destroy our tool.

Permanence protects the crew from any external influence and places it in the psychological conditions necessary to operate the tool.

It also guarantees credibility in respect of the industrial tool by setting a level of requirement that tolerates no leeway, and the same holds for the support resources. It sets a threshold of operational excellence and backs up the internal credibility of the mission among the submariners.

In other words, permanence at sea is a key aspect of the credibility of our deterrence. It is a case of the concept that imposes the stance, rather than the stance that dictates the concept. However, it should be specified that permanence at sea does not mean being on high alert on a permanent basis.

C. Industrial support, the second key to the power of the deterrent

All of this is founded on a high level of expertise and industrial independence, which is the fruit of a long excellence process that is envied by many a country. The civilian and military tandem is a guarantee, as illustrated by CEA, Orano (formerly AREVA), ArianeGroup, to name but a few. We are in the long term: the Rubis SSN, the first in the famous series of SSN 72s, was commissioned in 1983 and is still in service to this day.

Technical support for such complex installations is of course absolutely essential. The naval nuclear propulsion system is a precious asset that only ourselves, the United States, Russia and China possess – the United Kingdom bought the Americans' system. Maintenance in operational condition ensures the availability of the submarines and ensures that the crews continue to trust in the safety of their vessels, which is an important factor in the durability of the submarine forces. Trust in the platform is an essential factor in securing loyalty. Personally speaking, with 27,000 hours of dive time, I have never been afraid, even after the *Emeraude* accident in March 1994. That is why the historic link with NavalGroup, the heir to a long history of design, manufacture and maintenance of submarines, is essential.

I could mention many more, including Thales, etc.

In the field of submarine-launched ballistic missiles (SLBMs), it was the M4 missile that fired *Ariane 4*, but *Ariane 5* that fired the M51. The prospect of *Ariane 6* is therefore excellent news for us.

D. Future projects

As President Jacques Godfrain recalled, modernity is part of sovereignty. It is therefore important to secure our forces over the long term, first by manufacturing a new-generation SSN, then by equipping the SSBN with fourth-generation technology. For the first time we will have a submarine, the *Suffren*, that has been completely designed and manufactured by a civilian company: DCNS, which is now NavalGroup.

And here lies the challenge for the *Direction générale pour l'armement* (DGA), which has to maintain the Defence technological and industrial base (DTIB).

Lastly, we must not forget the land infrastructure and, in this respect, Île Longue is a real textbook case. In November 1972, the Strategic Oceanic Force (FOST) took to the seas and has never left. We must therefore maintain heavy industrial equipment – reactor workshop, pyrotechnic area, electric factory, pools – while ensuring that they meet the current safety standards, and gear Île Longue to the new weapons systems while retaining the operationality posture.

Conclusion

Jean-Jacques Bridey[*]

To conclude, I would like to thank Bruno Racine and FRS for organising the conference in October 2017, a fascinating event that allowed us to highlight the depth of the history of nuclear deterrence in France.

I was given the honour of making the closing remarks; I am particularly sensitive to this as, during the last term of parliament, I was the draughtsman for the opinion on equipment and deterrence appropriations, as well as co-rapporteur of a fact-finding mission on the technological and industrial challenges of the renewal of the two components of our deterrence.

When reading the contributions on the spirit of resistance and the inception of CEA, I remembered what René Char said about the Resistance: "Our legacy is preceded by no testament". This is not the case with the French deterrence; its founding event is essentially the disastrous collapse of June 1940. It is indeed France's desire never again to suffer such a defeat that is behind this "never again!" and which led to the development of the French nuclear deterrence. And that is one of today's challenges: preventing our deterrence from becoming a mere testament, a mere succession in the notarial meaning of the term.

Even if most of us here are convinced of its relevance and also convinced that the current global developments further strengthen this relevance, let us not hide the fact that the memory of the founding act of deterrence can recede and fade.

It is said that general public opinion in France is in favour of maintaining deterrence; I too think it is. But what does tomorrow hold, or the day after tomorrow? Let us not forget that an international campaign that we opposed nonetheless ended in the adoption by the United Nations in July 2017 of a treaty on the prohibition of nuclear weapons. And this happened even though, during this time, North Korea demonstrated its long-range ballistic capabilities as well as the more-than-worrying progress of its nuclear weapons technology.

Blindness appears not just to be an ailment from the 1920s, given the procession of short-sighted treaties. I therefore believe that we should not count excessively on the mere perception of a threat in order to guarantee the sustainability of our deterrence.

In substance, the common thread of this conference leads me seamlessly to the crux of what I have to say: to national independence and nuclear deterrence, from past to present of course, but also to the future.

The long continuity of the French deterrence, its capacity to adapt, to transcend party-political divides, the exceptional coherence between the tool and the deterrence doctrine: all of this

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could only have been established or strengthened with the belief of the majority of our citizens. It is this living legacy that needs to be kept up, and it is this backing that needs to be strengthened.

From my point of view, I see two possible approaches that could allow us to achieve this. The first involves industry and research; the second relates more traditionally to the political debate.

As regards our industrial and research capabilities, the legacy is exceptional in all respects. The decision to build a deterrent was not taken because we had the capability; it was taken on political and military grounds, and the capabilities followed.

I would just like to touch upon this, as it is a subject that is dear to me and which has not necessarily been the focus of debates at this conference.

France chose independence and autonomy as its doctrine, but has also given itself the material resources to achieve this autonomy. Those contributing to deterrence are thus involved throughout the chain: design, production, commissioning, maintenance, upgrade and decommissioning. This holistic control of the process, which places us at the same technical level as the United States, with quite remarkable resource-saving, is one of the conditions for maintaining the skills required for an effective deterrence, and this must be preserved.

The structuring role of the French nuclear deterrence for the creation of cutting-edge industries is well known, but I think that this should be more publicised in order to counter simplistic and recurrent discourses that present deterrence in terms of its cost only, discourses that can even be heard, albeit discreetly, within sections of our armed forces. It is therefore this phenomenon that must not be neglected.

The pull effect generated by our deterrence that has been observed obviously applies to the past, as all of our naval construction and a significant share of the aerospace industry derive their excellence from nuclear deterrence. It also applies to the present and the future. Nuclear deterrence has forced the industrial players to continuously improve their performance, and thus control complex technologies. The industrial players in the naval sector often repeat this: an SSBN requires over twelve million hours of work and one million parts. It houses a nuclear reactor, a space centre, a small town capable of sustaining itself completely for ten weeks, all in a discreet manner in a 150-metre long and 14-metre wide cylinder. It is probably the most complex industrial object in the world.

Another example: nowadays, the ability of the French company Sodern to win the tender launched by One-Web for the supply of 1,800 star sensors stems from the French deterrence and from requirements that have forced this company to master extremely complex technology.

Similarly, the computation needs of CEA-DAM within the framework of the simulation programme have allowed for the development of a fully fledged and structured French industrial computation sector. Nowadays, ATOS-Bull can claim to be a go-to high-performance

computation industrial company and is one of the leading three companies in the race for the exascale – billions and billions of calculations per second.

More broadly, the French nuclear deterrence benefits a whole host of companies dispersed across the country. Thus, a study by the Foundation for Strategic Research noted, in respect of DCNS, that 99% of the volume of the orders for the deterrent/SSBN activity are placed with suppliers located in France, spread across 80 French *départements*. This regional dispersion is, of course, an economic asset, but it is also a political asset that allows for the deterrent to be maintained over the long term.

Lastly, technical skills maintenance and the robustness of the industrial base depend on one requirement: the continuity of the workloads and the seamless shift between the design studies and the production phases.

As stated by the former Chief of the Defence Staff, Pierre de Villiers, before the Defence committee on 6 May 2014, “nuclear deterrence is a story that cannot take hiccups or stoppages”.

However, this question is certainly once again going to form part of the political debate, to the benefit of the decisions still to be taken in order to renew the two components of the French deterrent. It is true that the debate on the matter of principle was decided during the presidential campaign, since President Emmanuel Macron had included in his manifesto the long-term continuation of both complementary components of the deterrent. Examined in spring 2018, the Military Planning Acts (LPMs) implement this decision.

I dare not say that it will be an easy debate, as the challenges to be met are huge: even within the framework of an increase in defence appropriations, it has to be noted that the conventional arms needs and those linked to the progressive growth in the needs linked to the renewal of the French deterrent are almost concomitant.

This will obviously lead to arbitration and debates, with arguments that we can already imagine relating to the level of strict sufficiency or on the “foreclosure effect” – note the use of inverted commas – on the conventional market.

To my mind, the best way of addressing this is to have an open and reasoned debate – quite simply because it is a requirement of the Republic, but also because the deterrence dossier is sound when it is examined seriously and objectively.

We are indeed talking about the future here. The renewal of our two components relates to the whole set of tools: new submarine, developments to the ballistic missile, new missile for the airborne component, issue of the air transporter, not to mention the nuclear force environment. We can clearly see the breadth of the spectrum of scientific and technological skills that will have to be mobilised over the long term in order to guarantee the credibility of the French deterrence over a long period. The new equipment will be commissioned progressively as of 2035 and, given their foreseeable shelf life, it is our grandchildren, or even

our great grandchildren that they will protect through to 2080. It is therefore a long-term investment, which will upgrade our defence system, our industry and our research.

We therefore have nothing to fear from the debate.

My predecessor, Patricia Adam, organised a cycle of hearings with the Defense committee, and this exercise contributed significantly, to my mind, to establishing the legitimacy of the decisions taken during the previous parliamentary term. In one form or another, I would like the Assembly to have another reasoned discussion in order to prepare for the structuring technical and budgetary choices that will be presented to us.

In substance, *via* these debates, we will have to maintain another type of resistance, a sustained resistance to the soothing voice of the easy choice and disengagement, to disingenuous discourses and to a sort of dictatorship of “the immediate”.

This is the only way we will be able to maintain and transmit this legacy of the French nuclear deterrence, which is much more than that – it is a national treasure.

Acronyms

ASMPA: *Air sol moyenne portée ameliorée* (enhanced medium-range air-to-ground missile.
AWE: Atomic Weapons Establishment.
BBC: British Broadcasting Corporation.
BCRA: *Bureau central de renseignements et d'action* (Central Bureau of Intelligence and Operations).
BEG: *Bureau d'études générales* (General Studies Office).
BNF: *Bibliothèque nationale de France* (French National Library)
BPPB: *Banque de Paris et des Pays-Bas*.
CCRSDN: *Comité de coordination de la recherche scientifique de la Défense nationale* (Committee for the Coordination of Scientific Research for National Defence).
CEA: *Commissariat à l'énergie atomique et aux énergies alternatives* (French Alternative Energies and Atomic Energy Commission).
ECSC: European Coal and Steel Community.
CERES: *Centre d'études, de recherches et d'éducation socialistes* (Centre for Socialist Studies, Research and Education).
CERN: European Council for Nuclear Research.
CFLN: *Comité français de libération nationale* (The French Committee of National Liberation).
CIPRA: *Centre international d'enseignement en prospection et valorisation des minerais radioactifs*.
CIR: *Convention des institutions républicaines* (Convention of Republican Institutions).
CNES: Centre *national d'études spatiales* (National Centre for Space Studies).
CNR: *Conseil national de la Résistance* (National Council of the Resistance).
CNRS: *Centre national de la recherche scientifique* (French National Centre for Scientific Research).
CNRSA: *Centre national de la recherche scientifique appliquée* (CNRSA).
CORAN: *Convention des officiers de réserve pour l'armée nouvelle* (Convention of reserve officers for the "New Army").
CSCE: *Conférence sur la sécurité et la coopération en Europe* (Conference on Security and Cooperation in Europe).
DAM: *Direction des applications militaires du CEA* (Military Applications Division of CEA).
DGA: *Direction générale de l'armement* (General Directorate for Armament).
DGSE: *Direction générale de la sécurité extérieure* (Directorate-General for External Security).
DGSS: *Direction générale des services spéciaux* (General Directorate for Special Services).
DICA: *Direction des carburants* (Director of Fuels).
DREM: *Direction des recherches et exploitations minières* (Department of Mining Operations and Research).

DSIR: Department of Scientific and Industrial Research.
DTIB: Defence technological and industrial base.
EDC: European Defence Community.
EDF: *Electricité de France* (France's electric utility).
EEC: European Economic Community.
ENA: *Ecole nationale d'administration*.
ENS: *Ecole normale supérieure*.
EPCI: *Ecole de physique et chimie industrielles de la ville de Paris* (ESPCI today).
EPURE: *Expériences de physique utilisant la radiographie éclair* (Joint Construction and Operation of an X-ray Facility).
FANU: *Force d'action navale nucléaire* (Nuclear Naval Action Force).
FBI: Federal Bureau of Investigation (United States).
FFC: *Forces françaises combattantes* (French Fighting Forces).
FFL: *Forces françaises libres* (Free French Forces).
FOST: *Force océanique stratégique* (Strategic Oceanic Force).
FNS: *Force nucléaire stratégique* (Strategic Nuclear Force).
FTA: Free Trade Area.
GREFHAN: *Groupe d'études français d'histoire de l'armement nucléaire* (Nuclear History Programme).
GPRF: *Gouvernement provisoire de la République française* (Provisional Government of the French Republic).
HCCRS: *Haut comité de coordination de la recherche scientifique* (High Committee for the Coordination of Scientific Research).
IAEA: International Atomic Energy Agency.
IC: Imperial Chemical Industries (United States).
IDS: Initiative de défense stratégique (Strategic Defence Initiative).
IHEDN: *Institut des hautes études de Défense nationale*.
MAUD Committee: Military Application of Uranium Disintegration.
MBFR: Mutual and Balanced Force Reductions.
MLF: Multilateral Force.
MRBM: Medium-range ballistic missiles.
NATO: North Atlantic Treaty Organisation.
NDRC: National Defense Research Committee (United States).
NGO: Non-Governmental Organisation.
NPT: Non-Proliferation Treaty.
OSRD: Office of Scientific Research and Development.
OSS: Office of Strategic Services.
PALEN: Programme de préparation à une limitation des essais nucléaires (Programme for the Preparation of Limitations to Nuclear Testing).
PCF: *Parti communiste français* (French Communist Party).
PS: *Parti socialiste* (Socialist Party).

RAF: Royal Air Force (Royaume-Uni).
SACEUR: Supreme Allied Commander Europe (NATO)
SDECE: *Service de documentation extérieure et de contre-espionnage* (former DGSE).
SEDARS: *Syndicat d'études pour le développement des applications des radioéléments synthétiques* (The Study Syndicate for the Development of Synthetic Radioelement Applications).
SERP: *Syndicat d'études et de recherches pétrolières* (Oil Prospecting Corporation).
SFIO: *Section françaises de l'Internationale ouvrière* (French Section of the Workers' International).
SHD: *Service historique de la défense* (Defence Archives Service).
SIS: Special Intelligence Service (United Kingdom).
SNLE: Sous-marin Nucléaire Lanceur d'Engins (Missile-launching nuclear submarine).
SSBN: Nuclear-powered ballistic missile submarines.
SSN: Nuclear-powered attack submarine.
STA: Service technique de l'armement (Technical Armaments Service).
TA: Tube Alloys (United Kingdom).
TNA: *Tête nucléaire aéroportée* (airborne nuclear warhead).
TNO: *Tête nucléaire océanique* (seaborne nuclear warhead).
UK: United Kingdom.
UMHK: Union minière du Haut-Katanga (Mining Union of Upper Katanga).
UN: United Nations.
UNESCO: United Nations Educational, Scientific and Cultural Organisation.
UNGG: *Uranium Naturel Graphite Gaz*.
USA: United States of America.
USSR: Union of Soviet Socialist Republics.
WEU: Western European Union.
ZEEP: Zero Energy Experimental Pile.

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