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# **Jean Mariani's bumpy road**

## **An ambitious young physicist seduced by Pétain's National Revolution**

Christophe Eckes<sup>1</sup> and Laurent Mazliak<sup>2</sup>

**Abstract:** *The present article deals with the case of a young French physicist, Jean Mariani, who in the 1930s, alongside Léon Brillouin, reflected on the philosophical implications of quantum theory. During the German occupation, Mariani redoubled his activity but also showed himself to be a resolute supporter of the Vichy regime. Condemned at the Liberation, he received astonishing support to be welcomed at the Institute for Advanced Studies in Princeton.*

### **Introduction**

The present short note takes up and completes the study (Eckes et Mazliak, 2023) we made a few months ago about a small group of French scientist-philosophers who were interested in the development of quantum mechanics in Paris, in contact with pioneers such as Louis de Broglie or Léon Brillouin. In the article recently proposed for a thematic volume of *Philosophia Scientiae* devoted to the French academic scene during the Second World War, we showed how this small group had sought to oppose a certain hold of the conceptions defended by the Vienna Circle following the congress of scientific philosophy held in Paris in 1935, following the path traced by the Swiss philosopher Ferdinand Gonseth. Moreover, the upheavals brought about by the defeat of June 1940, the occupation and the change of regime had allowed some members of the group to consolidate their position with a marked opportunism. The two most active members of the group, Jean-Louis Destouches and Jean Mariani, took part in 1940 in the creation of a publication "Sciences, Langage, Connaissance" (Science, Language, Knowledge) in which they diffused, among other things, reflections that had been sketched out during a week of study spent in the small resort of Morgat on the coast of Brittany in the fall of 1938.

The fate of Destouches and Mariani after the war was, however, very different. If little accountability seems to have been demanded of Destouches for his activity during the occupation, Mariani had to endure severe reprisals which he tried to overcome by being invited, in a rather astonishing way, to the Institute for Advanced Studies in Princeton. Recently discovered archives show that this adventure was a clear failure which illustrates how, after the conflict, networks more or less linked with supporters of the Vichy regime had sought to help individuals in the United States who were confronted with the post-war purge in French administration, including in the scientific milieu. It thus seemed interesting to us to return to Mariani's career, in more detail than we had done in the article in *Philosophia Scientiae*.

### **1- Jean Mariani, young and ambitious physicist**

Mariani obtained a licence ès sciences in Lyon in 1930 and joined, in 1931, the editorial board of the *Revue de synthèse*, in which he assisted the physicist Jean Langevin (son of Paul) for the "natural sciences" section. Mariani's activities for the *Revue de synthèse* continued until February 1936: he listed works in the physico-mathematical sciences and published two notes ((Mariani 1931) and (Mariani 1932a)), the first one showing a marked interest in the applications of group theory to quantum mechanics. In 1932, the *Journal of Physics* and the *Radium* published an article on the "physical meaning of groups of transformations" in which he explained his philosophical options on quantum mechanics. He shows first of all that the notion of observation does not have the same meaning in classical physics and in quantum mechanics. In classical

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physics, it would be a matter of "determining the objective properties of the systems studied" independently of the observations made. In quantum mechanics, on the other hand, "it is impossible to arrive, even theoretically, at the knowledge of such objective properties", because of the interaction between "the measuring instrument and the observed system" (Mariani 1932b, p. 221). This leads to the statement of a "principle of subjectivity", according to which "the observed systems do not possess objective properties and geometric structures" (Mariani, 1932b, p. 221). Nevertheless, it is possible to compare the results of an observation with each other. This comparison results in laws of nature that are formally invariant under the action of the group of transformations attached to the system under study (Mariani, 1932b, p. 223-224).

After sending this article to the *Journal de physique*, Mariani became Léon Brillouin's assistant at the Collège de France. In the early 1930s, Brillouin was one of the main promoters of quantum mechanics in France (Vila-Valls 2012, p. 129 ff) and, in January 1932, he succeeded his father Marcel in the chair of theoretical physics at the Collège de France.

Mariani, Brillouin's assistant at the Collège de France (a position whose contours were in fact very vague and somewhat akin to that of a handyman), took advantage of this position to develop a program of philosophical interpretation of quantum mechanics that he seems to have proposed to Brillouin a few years earlier and that must have seemed sufficiently interesting to him to recruit the young man. In his thesis on the diffusion of quantum mechanics in France, Vila-Valls suggests that Brillouin had little interest in philosophical debates, and there are indeed few texts from the 1930s written by Brillouin on these questions. But our research seems to reveal that Brillouin in fact delegated to Mariani and Destouches the participation in these debates where they could usefully expose his own conception of quantum theory which was aligned neither with the wave theory of de Broglie, nor with the views of the Copenhagen school. If he seems to have occupied a lot of space in Brillouin's entourage during these years, the memory that Mariani left is contrasted. The physicist Anatole Abragam writes in his memoirs: "(Brillouin) gave a two-year course on tensors and their applications. I liked his course and I came to offer my services. He dismissed me with a very curt "See my assistant". His assistant, a man named Mariani, was said to play tennis very well, but he had given a lecture at De Broglie's seminar which discouraged me from going to see him. Exit Brillouin" (Abragam, 1989). Abragam further complains about a time when the very hierarchical functioning of the French university meant that the research candidate was a "rugby ball" that was "passed around" without taking the time to get interested.

Mariani took advantage of his position as assistant to develop his program of philosophical interpretation of quantum mechanics. If Brillouin did not intervene in these philosophical debates (Vila-Valls 2012, p. 134), he seems to have delegated to Mariani and Destouches the task of participating in them.

The first congress of scientific philosophy took place in Paris from 15 to 23 September 1935. If it was dominated by logical positivism in its Berlin or Viennese version, other aspects of scientific philosophy were expressed, notably in the philosophy of mathematics, as attested by the intervention of Gonseth, who endeavored to reconstitute the genesis of the rules of logic that characterized the practice of proof in mathematics. He maintains that mathematics "is oriented from the concrete of intuition to the abstract of pure logic (...) without the latter being itself pre-existent and pre-determined in its essence" (Gonseth 1936a, p. 2). In doing so, Gonseth considers that logic is a physics of the object of any kind, before criticizing head-on the representatives of the Vienna Circle (Gonseth 1936a, p. 23).

Mariani was one of the invited speakers at the Paris congress of 1935 and presented a paper on "Objectivity in mathematics and physics deduced from the theory of groups", not reproduced in the proceedings of the congress. He extended his reflections on the principle of subjectivity with the publication of (Mariani 1937). Initially focused on the questions of objectivity and subjectivity in physics, this text questions these categories in various fields of life, in particular in psychology. Brillouin prefaces the work in a very

laudatory tone, underlining the principle of subjectivity introduced by Mariani in 1932 and revisited in this work. For Mariani, quantum mechanics constitutes "the example of a theory in which the objective laws of nature do not translate the objective properties of objects" (Mariani 1937, p. 26). He also pays particular attention to the systems of axioms in the logical-mathematical sciences and indicates that he agrees with Gosseth's thesis on logic as the physics of any object.

Besides Mariani, another young physicist seems to have been particularly seduced by the approach proposed by Gosseth: Jean-Louis Destouches. To this small group was also added, even if it was in a more distant way, the philosopher Gaston Bachelard who since his text of 1934 "the new scientific spirit" also pleaded for an applied rationalism which realizes a median way between the idealism and the realism. It was moreover during the Paris congress of July 1937 (nicknamed Descartes congress because its pretext was the third centennial of the publication of Descartes' Discourse on the Method) that Gosseth and Bachelard seem to have met for the first time. In the present paper, we shall not comment further on Destouches, Bachelard and Gosseth and we refer the reader to our paper Eckes and Mazliak (2022) for more details.

In 1937, Mariani published at Hermann a work entitled *limite des notions d'objet et d'objectivité*. Prefaced by Brillouin, the book was devoted to the question of objectivity and subjectivity in physics and the way in which thinking about this theme leads to questioning these categories in all the fields of life.

Brillouin's introductory text was very laudatory and indicated from the beginning that he had a clear desire to encourage Mariani.

*it seemed to me indispensable to proceed to a fundamental revision of the scientific concepts, a revision of a philosophical nature at first sight, but whose practical consequences could be of great importance. (...) What Mariani presents, under the name of principle of subjectivity, is this affirmation that the imagined representation, in the form of an object, corresponds only approximately to reality, so that the essential of scientific laws can and must be presented independently of any particular representation. The aim of science is not to give us a description, more or less colored and detailed, of the external world; the scientific knowledge is the one that allows, from a certain number of measurements and observations made at a given moment, to predict the result that will be given by some later measurements; the prediction can be only approximate and expressed by laws of probability; in some particular cases, the prediction will be a certainty. The laws of prediction are the goal of our research.*

The ambition defended by Mariani is to build a theory of subjective knowledge. He writes that "it was necessary to arrive until quantum theory to find the example of a theory in which the objective laws of nature do not translate the objective properties of the objects" Mariani (1937, p.26). It is therefore necessary to accept to abandon the idea of an objectivist axiomatics. For Mariani, the great merit of Hilbert's axiomatics for geometry is to allow a purely subjective approach in the sense that the particular representation of geometric beings is left to the free choice of the observer. In such an approach, if the logical relations have the maximum objectivity, the fundamental geometric beings have the maximum subjectivity. "Hilbert did not notice that this change of point of view could serve as a basis for a kind of meta-axiomatics, constituted by the principles of objectivity and subjectivity, which regulate the scope of the axioms". Mariani then remarks that he joins Gosseth in his conception of logic as "physics of the arbitrary object". Mariani underlines the validity of Gosseth's idoneism as a dialectical way between axiomatics (which is not at all a founding moment) and the experience of "new notions".

An audacious originality of Mariani's book is to extend his field of action from the theory of subjectivity to other horizons, and in particular, to psychology, leading to a radically subjective theory of knowledge. The theory of subjectivity of the world is based on the fact that "the substantially objective universe of the vulgar knowledge seems to have no kind of scientific basis: what appears primitively given, it is something eminently subjective, the sensation: in the limit of validity of this fact, the world is not objective as essence of the things". (Mariani 1937, p.66)

On July 22, 1938, on his return from the Cambridge 4th conference on the unity of science, the mathematician Maurice Fréchet reported to the Italian statistician Bruno de Finetti that he had mentioned his text "probabilisti di Cambridge" during his intervention, before adding that "certain philosophers of science who do not agree with the point of view of the formalist school of Vienna (especially represented at this 4th congress) will meet in a very restricted colloquium at the Grand Hôtel de la Mer in Morgat (Finistère) from September 10 to 17. In particular, Mr. Jean Mariani will deal with the subject of objectivity and subjectivity. Fréchet suggested to de Finetti to write to the philosopher Louis Rougier to ask for the program. Rougier anticipated the call and, on July 31, he sent de Finetti an invitation. The latter declined the invitation on August 3, but pointed out that he was "perfectly in agreement with the program" thanks to Fréchet's explanation of the origin of the group - and thus the opposition to logical empiricism.

Attached to the letter sent by Rougier to de Finetti was the invitation circular containing the program in the form of a list of six themes linked to a speaker: "lost philosophical positions" (Rougier), "Objectivity and subjectivity" (Mariani), "Physics and knowledge" (Destouches), "Logic and knowledge" (Février), "Science and knowledge" (Gonseth), "the new scientific spirit" (Bachelard). Among the protagonists who attended this event were the Swiss mathematician Rolin Wavre and the philosopher Georges Matisse. The organizers were keen to give a certain visibility to the meeting, as shown by an insert in the newspaper "Le Temps" of September 10, 1938, dedicated to this "congress of scientific philosophy". The *Entretiens de Morgat* were ultimately a founding act for the group around Gonseth who had just formalized his break with the Vienna Circle. Two other meetings allowed some members of this group to consolidate their ties: the Amersfoort Talks (September 19-25, 1938, published in 1939 by Hermann) and the Zurich Talks (December 6-9, 1938). A published version of the *Entretiens de Morgat* will see the light of day during the Occupation.

## **2- A troubled activity under the German occupation**

After the turmoil of the summer of 1940, Mariani was in Paris. On a request for authorization to access the library of the Institut Henri Poincaré, he indicated that he was preparing a thesis under the direction of Louis de Broglie. The latter countersigned the request by indicating "very favorable opinion". However, let us say right away that the thesis in question never seems to have been defended. On the other hand, the young physicist seems to have been quite active, as well as his colleague Destouches. According to documents in the Destouches papers, in the autumn of 1940, both of them considered creating a periodical publication that would go far beyond the reflections on the philosophy of science that had emerged from the lectures at the Collège de France and the *Entretiens de Morgat*. Aimed at non-specialists, this periodical project was intended to gather contributions ranging from mathematics to medicine, with some ramifications in the field of industry.

In the end, the ambitious project of a periodical carried by Destouches and Mariani at the beginning of the Occupation did not materialize, undoubtedly because of the practical difficulties that scientific publishing had to face at the time. We do not know which publisher was intended to take on this project. At the beginning of 1942, the editorial ambitions of Destouches and Mariani were revived, as shown by the model of a new project for a periodical entitled "Science et Connaissance" which, as the subtitle indicates, brings

together a "series of publications on scientific philosophy, logic and epistemology". An initial list of collaborators was proposed, offering a strong scientific and intellectual guarantee to this project.

It is in fact another type of publication by Jean Mariani that throws a cloudy light on his activity of the period. In 1941, the Van Oest publishing house published his book entitled "Reform of the French mind". The author wanted to underline that the threat of a French decline had been constantly denounced and foreseen by clear-sighted minds who underlined the maladjustment of French society to the modern world. But the ruling classes were deaf, and class and caste egoism reigned supreme. As Mariani writes, "The Frenchman, unlike the German, and this because of an absurd educational system, is more logical than imaginative. (...) Each time that the French genius has imposed itself on the world with a Du Gesclin, a Joan of Arc, a Napoleon, a Pasteur, it has been by an effort of dynamism, of renewal of practical sense that has broken the rigid and antiquated carcass under which it was supposed to be hemmed in and suffocated. At the center of the problem, the educational system, because "any school in our country is a school of pre-civil servants". But the intellectual problem is not less significant. For Mariani, who seeks inspiration in his works of physics, one extended with lightness teachings of the classic science, which engendered an erroneous extension of the notion of objectivity and by this way a decline of the idea of fatherland and French nation in the university. But the catastrophe revealed the bankruptcy of the objectivist obsession and of universalism. Mariani then rants against the Popular Front, which had precisely tried to objectify the need for economic equality, and this Marxist experiment ended in the industrial collapse of France and the disaster of May 1940. A rather impressive chapter (it is 1941...) is entitled "The German mentality": the author underlines there the very sharp sense of practical realities and the primacy granted to the facts of experience which characterizes a German people who keeps their feet on the ground while the French revel in speculations, under the leadership of a harmful gerontocracy. In a section devoted to the necessary reform of teaching, an examination of classic philosophy textbooks from the 1930s (those of Cuvillier or Challaye) reveals that they all seek to prove that Marxism and internationalism are the necessary outcome of the objectivity of science. There would have been, according to Mariani, a real will to keep the students away from a real reflection on science, as illustrated by the fact that the "certificate of history of sciences of the Sorbonne in spite of its intrinsic value is followed only by two or three amateur students". Calling for a necessary virility in action, the author demands the re-establishment of a strong state control and condemns the "liberalism which only seeks individual profit".

The trace of Mariani is more or less lost from the end of 1942 to the Liberation, even if his name appears in the two volumes entitled "Science, Language, Knowledge", the second one dated 1944, devoted to the publication of the talks given in Morgat. In fact, as we explain in our article in *Philosophia Scientiae*, the publication contained much more than what was its initial impulse. It was essentially Jean-Louis Destouches who was in charge, Mariani having more or less vanished into thin air.

At the Liberation, Destouches escaped any real trouble although his wife, Paulette Février, had some slight problems. But the Conseil supérieur d'Enquête (High Council of Inquiry) was severe against Mariani, as attested by his administrative purge file, including documents from the autumn of 1940 to the spring of 1955, to which is added a small file in the archives of the Direction de la surveillance du territoire (DST). We learn that in the fall of 1940, Mariani left compromising documents at the theoretical physics laboratory of the Collège de France. The administration of the Collège wanted him to leave his position as assistant, since Brillouin was no longer working there. Mariani was even forbidden access to the building from December 1940 on the decision of the administrator Edmond Faral. The documents left at the Collège de France were rediscovered in April 1945. They attest to links with the French national-collectivist party led by Eugène Deloncle. They also contain an unsigned libel to Marshal Pétain calling for physical violence against "Jews and left-wing saboteurs". This libel was accompanied by a list of 22 academics, including Edmond Faral, the physicists Pierre Auger and Eugène Bloch, the biochemist Nine Choucroun, the biologist Boris Ephrussi, the economist Jean Ullmo, and the philosophers Léon Brunschvicg and Jean Cavailles. In

the autumn of 1940, Mariani planned to publish a Manifesto to Marshal Pétain of about sixty pages, which, after being revised, would result in (Mariani 1941).

Faral gave copies of some of the documents thus discovered to Colonel André Serot's Air Security Service, in connection with Mariani's mobilization as a non-commissioned officer in the Air Force in 1939-1940, then in 1944-1945. Mariani was summoned on September 5, 1945 to explain his links with the French national-collectivist party, before his file was transmitted to the DST. On July 2, 1946, Faral sent the originals to the Ministry of National Education, with a letter in which he specified that the Assembly of Professors at the Collège de France had waited for Brillouin's return to France to rule on Mariani, before adding that Brillouin "had again left on a mission before the session (June 23, 1946) where the question was to be examined and decided". The Conseil supérieur d'enquête de l'Éducation nationale (CSE) took up the case and proposed on November 20, 1946 that Mariani be automatically retired. The CSE considered that Mariani was the author of the libel targeting Jews and left-wing personalities, which he had knowingly accompanied with a list of academics considered "to be his adversaries".

### **3- The failure of an American restart**

On November 27, 1946, the Ministry of Education decided that Mariani should be dismissed without pension, the highest penalty in an administrative purge procedure. Mariani lodged an appeal on the grounds of formal defects before the Conseil d'Etat in February 1947, which was finally rejected in May 1948. Nevertheless, foreseeing an unfavorable outcome of his request, Mariani had in fact already in the spring of 1946 prepared his backgrounds to seek help from his former acquaintances, Rougier and Brillouin, who had now settled in the United States. The archives of Princeton University, which have preserved the entire Mariani file, make it possible to follow the case very closely.

On March 16, 1946, Louis Rougier sent a short letter to John von Neumann at Princeton in which he mentioned that "two of his best friends (sic), Jean Louis Destouches (Institut Henri Poincaré, 4 rue Thenard, Paris V°) and Jean Mariani (Collège de France, 16 rue Monge, Paris V°) asked me to let you know that they are working on the same field as you are doing (...) Both of them would be very interested in receiving a scholarship for the Institute for Advanced Study. "

It is quite remarkable that at this point Rougier openly displayed his unwavering support for Pétain's defense (Rougier (1946)), a fact that did not seem to trouble von Neumann at all either because he was uninterested in the twists and turns of French domestic politics, or because the hostility displayed by the United States towards de Gaulle gave Rougier a favorable position in his eyes as a frantic anti-Gaullist. He hastened to take the bait and sent a letter to Mariani on April 11, 1946, in which he indicated that he would be very happy if the invitation of Mariani and Destouches to Princeton could take place.

In June 1946, Mariani took advantage of the visit to Paris of his former boss, Léon Brillouin, to ask him to intervene in his turn. Back in New-York in August 1946, Brillouin wrote to John von Neumann. In this letter, Brillouin wrote a rather staggering eulogy of Mariani. He wrote

*Mariani is a very interesting fellow, practically self-educated, with extremely bright and original ideas, which he has not yet been able to publish in a final and logical shape. He started about 10 years ago (sic), and came to me at the Collège de France in Paris, to explain how he wanted to investigate the connection between electromagnetism, gravitation and relativity. I immediately noticed a boy with great gift, but also great lacks in his education. I took him as my assistant at the Collège de France, and he worked near me for 3 years until the war. His theory was progressing,*

*but was still very crude in some places - where he was making rather wild (but not at all unreasonable) guesses. When I went back to Paris last spring, Mariani brought me an enormous amount of theoretical work he had accumulated during the years of war, when he was working all by himself in a remote country place of France. (...) This man needs some real help and sound advice, and he should be able to discuss his problems with you and with Einstein. He has been practically isolated for 7 years, without any contact with any scientist who could even guess what he was after. His only connection was with Cartan who gave him some very good advice about the mathematical structure, but was entirely unsympathetic with the physical interpretation. To put it frankly, Cartan felt as if someone was trying to pervert his nice young boy and to use a fine theory for a dirty business.*

At the end of his lyrical flight, Brillouin pointed out Mariani's tennis skills (which he could have made his profession), and added, perhaps showing a slight concern for the one he indirectly recommended to Einstein: "I told you the boy is slightly crazy but I feel he needs encouragement and a proper environment".

The question arises as to what, in Brillouin's support of his former assistant, is a matter of credulous naivety in the face of what Mariani had told him and what is a deliberately dishonest strategy to force his way into Princeton. It is rather difficult to think that Brillouin was unaware that Mariani, not so isolated, had published several notes at the CRAS during the Occupation, presented by Louis de Broglie, that he was in contact with the latter and with Destouches, and no doubt with other participants in the two volumes of "Science, langage, connaissance". If it is possible that, in exile in the United States since 1941, he was not aware of these volumes, it is slightly surprising that, before leaving for New York in 1941, he did not perceive the political orientation of his young colleague.

In any case, Brillouin could not have been unaware that he was himself a scientist much appreciated by his American colleagues and that they would not fail to be attentive to his recommendations. Von Neumann immediately sent a circular letter to his colleagues at the IAS to remind them that the idea of inviting Mariani had already been raised. On December 11, 1946, von Neumann informed Brillouin that the IAS had decided to invite Mariani for the academic year 1947-48 and in the letter sent the same day to Mariani, he mentioned that he had been awarded a grant of \$2100. On January 6, 1947, Mariani eagerly accepted, and von Neumann, on January 15, expressed his great joy, not without taking the time to give him advice on how to find housing in Princeton because the local situation was very congested. Exchanges continue until the summer to ensure that Mariani has the most comfortable stay. On April 21, Frank Aydelotte, director of the IAS, sent an official invitation to Mariani to the American consulate in Paris to obtain a visa. He points out that it is "exactly the kind of letters which I have written on various occasions to Niels Bohr in Denmark, Dirac, Whitehead, Newman and Burkill in England, and I see no reason why it should not be satisfactory to our officials in Paris. The status which we are offering you is exactly the status which had been offered to the men I have indicated above and a large number of other distinguished scholars (including Hardy) from various countries."

One may legitimately wonder why Aydelotte felt compelled to add this last sentence. At the very least, it suggests to Mariani that he should be aware of the honor of being welcomed in this temple of physics that is Princeton (in an earlier letter, Mariani himself had not failed to point out that he was "a little anxious when I see on the book of the Institute the names of Einstein, Pauli, Wigner and so on"). It may also indicate a certain perplexity on the part of the director as to the legitimacy of the invitation. On May 27, 1947, Mariani announced his arrival at Princeton for September.

He actually arrived in October 1947. The consultation of his questionnaire at the immigration department holds some surprises, and reveals the character that Mariani was building before his arrival at the IAS. We



read that in addition to his Licence es sciences obtained in Lyon in 1930, he would have obtained a doctorate in sciences at the Sorbonne in 1946. Moreover, he declared himself "Director of Studies" of the Institute of Philosophy of Science at the Sorbonne since 1936, and assistant at the Collège de France since 1932. Finally, he was awarded a Lavoisier medal by the Philomathic Society of Paris in 1943. Apart from the position at the Collège de France, which we have already said had no real institutional significance since it was the sole wish of the holder of a chair, we have not been able to confirm any of the other assertions, and in particular the doctorate of 1946, which as was already mentioned seems to be absolutely fanciful.

In November 1947, just after his arrival at Princeton, Mariani was able to publish in the "letters to the editors" section a short paper in which he proposed an interpretation of the proportionality between the magnetic moment and the angular momentum of a celestial body which had just been verified by the astronomer H. W. Babcock for the star 78 Virginis (Babcock (1947) ) using the theory he had developed in his notes to the CRAS of 1944 (Mariani (1944a-b) ). It should be noted that such a communication is not a publication, in the sense that it is not subject to peer review, and it is likely that the institutional affiliation with the IAS, which Mariani did not fail to indicate, led to the inclusion of the letter without further discussion.

The same was not true of Mariani's bumpy submission of a publication to the journal Physical Review. Although we do not have the text in question, it is very likely that it was an English version of the text he had printed just before his departure from France by the Centre de documentation universitaire, entitled "*Théorie des champs macroscopiques*". This 98-page manuscript was intended to explain how to overcome the failure of general relativity to account geometrically for electro-magnetism, whereas it had succeeded perfectly in doing so with gravitation by replacing Euclidean geometry by Riemannian geometry. For Mariani, the mistake would be to try to find a more general system than Riemannian geometry, whereas it is the basic principles that must be modified. Indeed, contrary to the commonly held opinion, realistic physics is not even justified at the human scale and in order to interpret observable phenomena, it is necessary to modify our macroscopic representation of the world. (p.6)

"For a long time, the general philosophy and the classical psychology have shown that the usual representation of the familiar objects does not result (...) from the intrinsic immediate knowledge. It is built by a process of operations and relations from the purely subjective sensation. It is these operations that have an intersubjective or objective reality but through external objects of which they make us aware." For Mariani, the only objective reality is the possibility of observations. For example, for a magnet, it is the observation that creates the lines of force: this integral subjectivity thus offers a very different point of view from that of wave mechanics for which the intervention of the instrument only disturbs some of the intrinsic properties of the observed system. Here the properties are not disturbed but are created by the observation. It is thus a kind of radical non-realism, which is not an idealism "because the existence of the human mind plays no role in it", Mariani prefers to speak of sub-realism because his theory possesses a kind of virtuality, that of manifesting itself to the observation and in this sense, it is distinguished from pure positivism.

*In fact it is the analogue for the physical world of Hilbert's theory for geometry; in Euclid's axiomatics, the geometric beings, point, line, plane etc., are univocally determined and the axioms describe the intrinsic properties of these beings, without which they could not be conceived; in realist physics, the material bodies play the role of geometric beings in Euclid's presentation: they possess the intrinsic properties of charge, proper mass, etc., and are surrounded by fields; the laws of physics, which hold the place of Euclidean axioms, describe these properties and the distribution of fields. Hilbert's axiomatization has a completely different character: the geometrical beings are a priori indeterminate - like the material bodies in our physical theory - and the axioms are logical relations established between these beings, empty of concrete content; in the same way, in our conception of physics, there are objective relations,*

*established by observation between physical beings without properties in themselves.*  
(pp.16-17)

Mariani's idea is therefore to propose the introduction of a parameter  $\sigma$  and a function  $\psi(\sigma)$  in physical laws that allow to express an arbitrariness of choice available to the observer. The end of Mariani's essay (section VI, p.93) outlines his interpretation of the earth's electric field through his theory.

On February 9, 1948, John Tate, editor of the journal, sent Oppenheimer a brief message to inform him of the refusal of the publication: "I have had adverse comments from the Editorial Board. One of the Associate Editors writes that the style is too verbose. (...) He doubts whether the paper has any really new physical content."

Three months later, Tate received a letter from Brillouin in which the latter sent him a new rewritten version of Mariani's paper which he hoped could be published in the Physical Review. In the opening, Brillouin mentions that the paper "is a very original and important contribution to theoretical physics, and it opens new ways for theoretical investigations." But Brillouin, far from being satisfied with these positive words, adds two paragraphs that constitute a real panegyric of his former assistant

*I have known Mariani since 1933 when he became my assistant at the Collège de France in Paris, and I worked with him for a number of years trying to help him to clarify his ideas and to present them in a precise and logical way. His aim was to obtain a generalization of Einstein's general relativity in order to include the electromagnetic fields in the geometrical representation. Similar attempts had been made by H.Weyl, Einstein and many others but without any great success. Mariani finally discovered that a special kind of geometry, known as "geometry with torsion" could be used successfully for that purpose.*

*He made a very careful study of the mathematics of this geometry, as found in the classical books or papers of Cartan, Levi-Civita, Weyl, Eisenhart, and he proposed in 1936-1937 a physical theory based upon the geometry with torsion. One of the first results he obtained (1937) was a formula giving solar and terrestrial magnetism. This formula was rediscovered last year by Blackett. As for the geometries with torsion, they form the basis of the theory advanced by Schrödinger last year. On both points, Mariani has a priority of ten years at least. But he published only a few short notes in the French Comptes-Rendus and in some other little read publications. The war years made it impossible for him to get in touch with other physicists, and he first came to this country this year with a fellowship at the Princeton Institute.*

One is lost in conjecture as to how Brillouin could have come forward to support Jean Mariani in front of all the stars of the American academic world of the time. It seems impossible that Brillouin did not largely believe the words he used and that he really saw Mariani as a misunderstood genius. It is moreover probable that a certain form if not of disinterest, at least of delegation to Mariani and Destouches concerning the philosophical interpretation of quantum physics through the prism of the mathematics on which it is based, convinced him of the mastery of his subject by his young colleague.

After receiving such a letter, Tate could do no less than contact Oppenheimer again for advice. On May 20, 1948, he wrote him an embarrassed message.

*I am again appealing to you for advice with respect to the paper by Jean Mariani on "Unitary Field Theory and Cosmic Magnetism" which has been rewritten and*

*resubmitted to the Physical Review through Dr. Brillouin of Harvard. You may remember that both you and the Associate Editor found his first paper incomprehensible and I returned it to the author refusing publication in its present form but without prejudice to acceptance of a redraft. I enclose a copy of Brillouin's letter of transmittal.*

*I find the redraft of the paper incomprehensible but this is not surprising because I do not have the necessary mathematical background. I would like to ask you whether Mariani's work is known to you or other members of the Institute, and if so, whether it is regarded as sensible.*

Oppenheimer's response four days later was blunt about his personal opinion of Mariani's paper.

*Thank you for your letter about Mariani. I have not seen the revised manuscript and thus my advice may not be too helpful. There are a number of people here who are experts both in the mathematics and physics of the area in which Mariani works: Weyl, Taub, Veblen, von Neumann, not to mention Einstein. I think their view, like mine, has been that Mariani has made no real contribution. On the other hand, in matters as difficult as this, we should, I think, lean over backward to give people a hearing, provided what they write is clear and honest.*

*In its first version, Mariani's work was certainly not clear. If, with a kindly bias, one could now so find it, I would not continue to oppose publication. My own view is that the entire approach is rubbish, but more eminent men have made more categorical statements about things that have turned out to be very good.*

The article was obviously not published. A few articles by physicists in 1948 and 1949 mention Mariani's work, but not without expressing their skepticism. In *Nature* (20 March 1948), the English mathematician H. T. H. Piaggio wrote

*Mariani's latest treatment starts from philosophic considerations, akin to those of Kant, concerning the impossibility of knowing 'the thing in itself'. From the point of view of the average physicist, this is unfortunate. Even if he has the patience to read it, he may merely draw the depressing conclusion that no objective scientific measurement can exist. The next section of the work is something like a generalized theory of relativity, but with many coefficients that are quite indeterminate. Then suddenly, by means of a principle of identification, the treatment becomes much more definite. All the equations, except one, reduce to something like the ordinary gravitational theory of relativity. The one exception is the distinctive point of the theory, and its significance seems to be that a gravitational field must necessarily be accompanied by an electrical field. (...) Those who are interested in the matter will wish to examine Mariani's arguments for themselves; they will probably find the four short papers in *Comptes Rendus* easier to understand than the fuller and more philosophic version.*

The final documents in the Mariani file at Princeton provide a final touch regarding the stay at the IAS. Without knowing if it was related to a job application, in September 1951, the Division of Medical Sciences of the National Research Council sent to the IAS a request for information on its former trainee. If the secretary of the director of the IAS sends on October 2, 1951 a refusal ("Dr. Jean Mariani was appointed a Member of the School of Mathematics of the Institute for Advanced Study for the academic year 1947-48. I am unable to find anyone here who is willing to comment on Dr. Mariani's work or his sojourn at the Institute"), a preparatory sheet of the answer contains a pithy sentence of the mathematician Marton Morse, another member of the Institute, who writes: "I understand his mission here was not altogether satisfactory".

The trace of Mariani seems to be lost afterwards. The only precise document we found is the mention of his death on December 26, 1989 in New York, the news of which was transmitted in March 1995 for registration to the administration of his birth town Narbonne.

## Conclusion

The trajectory of Jean Mariani after the Liberation is eventful and illustrates in a singular way the chaos that reigned in the years following the return of the republican regime in France, when the contradictory ambitions to punish those who had compromised with the Occupier or the Vichy regime were mixed with the desire of the new authorities to ensure a certain continuity of services, against the background of the more or less clear and improbable connections and links that had been established during the troubled years between individuals with varied aspirations. What makes the case of Mariani interesting is that it concerns a rather young person, more or less unknown and therefore rather transparent, who benefited from rather extraordinary support for a few years that gave him a real chance to rebound. Even if it was a failure, the passage through the Princeton Institute illustrates how scientific networks were able to play in favor of personalities who would probably have had little chance, in another context, to benefit from such an invitation. In passing, it also illustrates both a certain indifference (or ignorance) of the political situation in post-war France and a pragmatic desire to cast a sort of modest veil over the period of the German occupation and the Vichy regime, at least for people who are not too prominent. Mariani eventually disappeared from circulation (or at least from the scientific scene) rather quickly in 1949 but he never seems to have been worried after his departure from France for his activities during the Occupation.

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