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The introduction of Pavlovism in France, its isolation in the USSR and the return of scientific exchanges between France and the USSR in the interwar and the immediate post-war periods

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This article analyzes French-Russian scientific relations in the fields of brain physiology and neuroscience concerning the central issue of Pavlovism, its birth in relation with Western science, its reception and diffusion in France, but also its distancing from the scientific trends of French psychologists and physiologists, including Russian former students of I.P. Pavlov. These issues are discussed from an epistemological point of view which is also necessary to understand how these scientific relations were resumed in the 1950s besides a complex political context. We analyze how the exchange of ideas on Pavlovism and more generally on neuroscience progressively excluded ideological concerns and rigid theoretical positions in the context of the creation of the International Brain Research Organization and neuroscience as an international research field.

Keywords: Neuroscience, I.P. Pavlov, France, Russia, Cold War, W. Drabovitch, L. Lapicque.

Relations between neuroscientists from East and West during the Cold War mainly concerned Pavlovism, but not exclusively[1]. By Pavlovism we refer to all the results, practices, epistemological foundations[2], generalizations and doctrines of the school of Russian phys-

[1] These relations also concern the French reception of the reflex studies by Wladimir Bechterev (1857–1927), and those on the nervous control of movements by the school of Nikolaï Bernstein (1896–1966). See: Barbara et al., 2011.

[2] I.P. Pavlov described his epistemological essential point, the exclusion of subjective factors in explaining his experimental results, in his communication to the XIVth International Congress

iologist Ivan Petrovitch Pavlov (1849–1936) and its successors on the functioning of the cerebral cortex.

France holds a very special place in the international history of Pavlovism, due to the dynamics of Franco-Russian political relations, I.P. Pavlov's debt to French physiology, and the role played by French neuroscientists in promoting Pavlovism in the international neurosciences during their institutionalization phase after the Second World War[3].

Compared with Lyssenkoism, Pavlovism represents a second official trend in Soviet biology from the 1930s onwards. Stalin's control of "orthodox" Pavlovism in the 1950s had repercussions just as tragic as those affecting genetics in the USSR. But gradually, and especially after most of the neuroscientists ousted during this period were rehabilitated in 1955 in Kiev, a less narrow Pavlovism was able to re-emerge in all its aspects, becoming part of international neuroscience through its adoption by the neurophysiological community.

This history, which has already been sketched out by us in other forms, is revisited here by extending the period before the First World War, taking better account of the scientific and political contexts from the turn of the 20th century to the 1950s in relation to a precise epistemological analysis. Our aim is to understand how the foundations of Pavlovian studies were laid from 1903 onwards, initially in continuity with European physiology. Then we will try to understand why and how Pavlovism rapidly distanced itself from Western studies in the 1930s. Contrary to what one might think at first glance, it was I.P. Pavlov's former students, as well as Parisian psychologists and physiologists, who took the initiative in modifying Pavlovian studies by taking mental states into account in interpretative schemes. On the other hand, as far as the USSR is concerned, our aim is to understand how Soviet Pavlovism was isolated and impoverished by its control under Stalin, until it was gradually able to regain the attention of neurophysiologists over the world. More specifically, we will show how some of Soviet physiologists gradually accepted to put their ideological biases in the background in order to discuss common brain neurophysiology projects integrated into the nascent neuroscience movement.

1. The French context of Pavlovian studies, their spread and transformations in France

When I.P. Pavlov set out to study "higher nervous activity" and systematize his conditioning method, he had already completed his great work on digestive functions, for which he was awarded the Nobel Prize in Physiology or Medicine in 1904. The term "conditional

of Medicine, Madrid April 23–30 1903 (Pavlov, 1904) and in his Huxley Lecture (Pavlov, 1906a, p. 911–915). The original Russian text was translated for the British journal.

[3] See: Barbara et al., 2011; Barbara et al., 2012; Dupont et al., 2016. These books are the result of a three-year research program funded by a CNRS *Groupe de recherche international* created by the author and directed in collaboration with J.C. Dupont. This program gave rise to three French-Russian colloquia in Paris and Saint-Petersburg. This article is dedicated to our colleague and principal Russian collaborator Eduard Izrailevich Kolchinsky (1944–2020) who then directed the Saint-Petersburg branch of the S.I. Vavilov history of science and technologies institute of the Russian Academy of sciences. We thank Sergey Viktorovich Shalimov who had been involved in the project for his kind invitation to write this paper. Also see on the topics of this paper with a different approach J.G. Barbara, Distanciation scientifique, rapprochements et coopération autour du Pavlovisme entre la France et l'URSS pendant la guerre froide, *accepted paper*.

reflex" was first used in French by his pupil Ivan Filippovich Tolotschinov (1859–1920)[4] in a paper he presented at the Helsinki Congress of Northern Naturalists and Physicians in 1902[5].

The following year 1903, I.P. Pavlov presented his conditioning project for the first time at the international congress of medicine in Madrid, in a lecture entitled "Experimental Psychology and Psychopathology in Animals"[6]. In this lecture I.P. Pavlov described the reaction of dogs to the anticipation of food intake by an external factor — termed a "condition" or a "conditional property" — such as a sound. He advocated the study of conditioning through an objective physiological psychology, renouncing any internal emotional state of the animal as an explanation[7].

If we are to understand how Pavlovian studies spread and were transformed in France, we need to clarify its original general perspective in order to understand how it was discussed, accepted or rejected. I.P. Pavlov defined the general concept of the reflex — or the "unconditional reflex" such as a salivation reflex — as a reflex associating no environmental conditions. On the other hand, a "conditional reflex" was defined by Pavlov by "the greatest number of factors that influence the results of a psychic experience in comparison with a physiological experience"[8].

When a dog salivated at the sound of a bell, I.P. Pavlov assumed that such a conditional reflex necessarily involved the establishment of an anatomical correlate, and in this case, a new nerve connection. This connection was qualified as "temporary" because the salivation reflex reaction to a sound depended on the number of repetitions during training and disappeared over time. As a result, it was assumed to be fragile and labile. Pavlov's aim was to study the anatomical and physiological laws governing its establishment.

This Pavlovian perspective slowly spread in certain scientific circles after 1906. The American scientific world first became aware of I.P. Pavlov's work when it was advertised in *Science* magazine in 1906[9], but Pavlov's work inaccessible in European languages had only a few adherents[10]. Similarly, French experimental psychologist Henri Piéron (1881–1964)

[4] See: Pavlov, 1927. Bibliographical searches need also to adopt the other forms of the surname found: I.F. Tolotschinov or I.F. Tolochinov.

[5] Tolochinov, 1902. This congress was held from July 7 to July 12, 1902 in Helsinki (Helsingfors), with three general assemblies and the sessions of eleven sections. The announcement appeared in the French press, notably in *L'Indépendance médicale* of January 1st, 1902.

[6] Pavlov, 1904. The general book was edited by Angel Fernández-Caro, secretary general of the congress. The text of Pavlov's lecture is also included in Pavlov, 1955, p. 151–168.

[7] However, as we will see later about Drabovitch's work, Pavlov's epistemological views were often contradictory with respect to the relationship between the "objective" and the "subjective" and to Psychology as a discipline (Todes 2014, 2022). Todes (2014, 2022) also has shown most clearly how Pavlov grappled throughout his life with how to handle the "subjective psyche" and how he used "subjective" anthropomorphic metaphorical reasoning in designing and interpreting experiments on higher nervous activity.

[8] Pavlov, 1904.

[9] Pavlov, 1906b. This text is a reprint of a report on I.P. Pavlov's Huxley Lecture published in the *British Medical Journal.*

[10] Gantt, Liddell. In 1909 Yerkes and Morgulis published a review in the *Psychological Bulletin*. Gantt's and Anrep's translations appeared in the late 1920s (Todes, 2014, 2022).

became aware of the importance of Pavlov's work presented in his *Huxley Lecture*[11] when it was published in the *Lancet* on October 6, 1906[12], but his appreciation of the importance of this work was limited and a few years later criticized by a more fervent follower of Pavlov, French zoologist and animal psychologist, Georges Bohn (1868–1948)[13].

Nevertheless H. Piéron pointed out that Pavlov's technique was remarkably useful in certain areas of psychology, in sensory discrimination in particular, since it had already "established that the dog could make auditory discriminations of a quarter tone by a progressive limitation of the reflexogenic action of sounds more and more similar in pitch"[14]. Although there were other methods of perceptual discrimination in animals[15], I.P. Pavlov's seemed very promising. For this reason Piéron admired I.P. Pavlov's results on psychic reflexes under environmental conditions[16] and he repoted Pavlov's *Huxley Lecture* in the *Revue scientifique* of November 24, 1906.

Pavlovian studies were thus launched on an international scale by a Russian Nobel Prize winner who was already recognized as an outstanding physiologist in the wider international community. In his success, I.P. Pavlov always respectfully mentioned his debt to numerous scientists, such as the French René Descartes and especially Claude Bernard, whose lessons of physiology he had studied assiduously[17]. But more specifically, I.P. Pavlov owed a debt to Charles Richet's concept of the "psychic reflex"[18].

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[11] See Piéron, 1958, p. 3–14. Later, H. Piéron would quote Pavlov's 1903 speech for example in H. Piéron, *De l'actinie à l'Homme*, Paris, PUF, 1958, p. 238. The quotation in question reveals that Pavlov did not consider the gap between "psychic experience" and "that studied by physiologists" to be very wide.

[12] Pavlov, 1906a.

[13] In particular, Bohn regretted that in 1910, in his book *L'Évolution de la mémoire*, Piéron found the contribution of Pavlov's method to the study of animal memory to be negligible, which he judged as very unfortunate (Bohn, 1912, 494). Bohn was director of the Biology and comparative psychology at the École des Hautes-Études. (Bohn, 1912)

[14] Piéron, 1958, p. 4.

[15] Razran, 1937.

[16] Although H. Piéron was of course aware of the earlier concept of "psychic reflex" also used by I.P. Pavlov. For example, I.P. Pavlov discusses "psychic reflexes" in his work published in French in 1901 (Pavlov, 1901). In fact, Pavlov uses the similar expression "psychic reflex action", already used by Ivan Sechenov and taken up independently and developed conceptually by Charles Richet in his physiology lessons as early as 1881. See: Richet, 1882. Richet writes: "Remember also that moral excitations, painful emotions act on the heart. It is easy to consider these phenomena as reflex actions. [...] It's a reflex that I will call *psychic* [Richet's emphasis], because consciousness and intelligence will intervene to modify it. But everything that essentially constitutes reflex action will be included: it will always be the transformation by nerve cells of an external force into a reaction by the organism. It is certain that moral emotions can produce fatal syncopations", Richet, 1882, p. 750. See also note 18.

[17] Pavlov, 1901, preface to the French edition, p. ix. In Koltushi, the statues of these two French figures, René Descartes and Claude Bernard, were placed on either side of the statue of I.P. Pavlov in memory of his attachment.

[18] For Ch. Richet, see note 11. In 1887, Ch. Richet developed his concept of "psychic reflex" in his *Essai de psychologie générale* (Paris, F. Alcan, 1887), p. 76–86. He quoted Sechenov only relatively anecdotally (p. 81), although a French translation of the Russian physiologist's texts had been published in 1884. In reality, the term "psychic reflex action" was not specifically associated with Sechenov's work, but was used occasionally by authors such as Jules Luys and Moritz Schiff (Schiff,

On the other hand, and even more generally, it is accepted that I.P. Pavlov was not the first to perceive the possibility of conditioning behavior to a sensory stimulus. This was a common observation when a domestic animal anticipated a food intake. It was even found, for example, in a text by French writer François Rabelais (1494–1553)[19] or even in an ancient Indian text[20]. This shows that it was not so much the concept of psychic reflex or even conditioning itself that constituted Pavlovian studies but its large-scale research program in experimental physiology for the study the laws of the animal and human psychic activities in large laboratories[21].

This enterprise was a model for international neuroscience, and its success was partly due to the dispersal of some of I.P. Pavlov's pupils outside Russia, as was the case in France. Thanks to the initiative of French psychologists, doctors and physiologists, and visits to Koltushi[22], the Pavlovian research perspective was integrated into digestive and neurophysiological studies in France, albeit at some distance from I.P. Pavlov's original science.

2. French psychologists' and physiologists' attraction to Pavlovian studies and gradual distancing from it

In 1901, when I.P. Pavlov's lessons on digestive glands appeared in French[23], Sorbonne physiologist Albert Dastre (1844–1917) was supervising the thesis of Lucien Malloizel (1879–1943)[24] on salivary secretion as a "psychic reflex"[25]. Prior to his lecture at the Madrid Congress in 1903, I.P. Pavlov had already devoted a specific chapter to the concept of

1870, p. 452). In the same manner, in 1887, when Ch. Richet advertised his *Essai de psychologie*, he mentioned that the expression had been used as early as 1843 in the article by German psychiatrist Wilhelm Griessinger (1817–1868) (Griesinger, 1843). A medical student at the time, W. Griesinger had been a reader of Johannes Müller and François Magendie, whose courses he attended in Paris. In this publication Griesinger described a model in which the simple reflex that localizes in the spinal cord is progressively integrated as it involves higher levels of the central nervous system, up to the brain, establishing complex, higher functional relationships ("psychic activities") dependent on representations (*Vorstellung*) and will (*Strebung*). On this point see Grosso et al., 2018. See also Richet, 1887, 1888.

[19] Jarius, 2017. Drabovitch, 1931, p. 418.

[20] Drabovitch, 1937a, p. 10.

[21] Todes, 1997, 2014. W. Drabovitch also insists on this point, see W. Drabovitch, 1937a, p. 9–10, Lapicque's preface, p. 5–6.

[22] Zoologist and experimental animal psychologist, Georges Bohn (1868–1948), visited Pavlov, as did Albert Le Play (1875–1964), *chef de laboratoire à l'hôpital Laënnec*, around 1912 who dedicated, to Pavlov his book *Technique opératoire physiologique. Tube digestif et ses annexes* (1912).

[23] Pavlov, 1901.

[24] Raphaël Lucien Geoffroy Jean Malloizel (1879–1943), doctor of medicine, doctor of biology, intern at the Paris hospitals at *La Charité* in 1903, born to Godefroy Alexandre Malloizel (1850–1905), sub-librarian at the Paris Museum, and Jeanne Sophie Maleyx (1856–1905), source *Geneanet*. For the work of L. Malloizel see Jean-Claude Lecas, 2011, p. 103–133.

[25] A. Dastre supervised this thesis from 1901 to 1905. Malloizel, 1905.

"psychic reflex" in his 1901 book[26]. Pavlov's work on the "psychic reflex" was taken up in France independently of the concept of conditioning. It seems it was psychologist Victor Henri (1872–1940), a laboratory assistant and then assistant professor in A. Dastre's laboratory since 1898[27], who convinced L. Malloizel to undertake this work by developing a permanent fistula for the submaxillary gland[28]. We therefore propose to critically examine Malloizel's project in its historical context.

By 1902, Victor Henri already had an impressive list of publications, ranging from psychology and experimental chemistry to histology and nerve physiology[29]. Of Russian origin, born in Marseille (France) and educated in Russia, V. Henri wrote critical analyses of works published in Russian, German and English for the French journal *L'Année psychologique*, for which he was editorial secretary. He was therefore well acquainted with foreign-language publications in psychology, physiology and anatomy of the nervous system, and in particular with Russian physiological literature. In addition, V. Henri was a perceptive and highly gifted experimenter, acquainted with mathematical analyses and always relating experimental results, both his own and those of others, to known theories published in various languages, pointing out any deficiencies.

L. Malloizel acknowledged that he had followed Victor Henri's advice to reproduce the results on digestive glands of the I.P. Pavlov school presented in his 1901 book. He devoted himself more specifically to the model of the dog's submaxillary gland[30], and received help from Albert Dastre himself in making fistulas[31].

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[26] See: Pavlov, 1901. The fourth lesson on the innervation apparatus of the salivary glands sensitive above all to appetite (p. 98 ff.) devotes an important section to the "psychic excitation of gastric juice" (p. 114–121). Without dealing with a "conditional reflex" as such, Pavlov considers in the fifth lesson on "psychic juice" (p. 122 ff.) that the demonstration of the mechanical factor in the secretion of gastric juice may fail because of a psychic factor associated with food intake (p. 141). In this case, the reflex associated with a psychic factor was considered an artifact by the experimenter, who had to prevent them in order to study non-psychic factors. But therein lies the idea that a secretion can thus be conditioned by a psychic factor, in this case independently of the experimenter's will. A parallel can be drawn with the conception of emotions in Claude Bernard's vivisections, which were initially considered as sources of artifacts, but later studied as such. See: J.G. Barbara, The figure of René Descartes in Neuroscience: relating to the Histories of Nerve Physiology, Reflex Action and Emotions, *accepted paper*.

[27] Nicolas, 1994.

[28] The permanent fistula for the submaxillary gland involved the surgical opening of a passage from the gland to the skin surface in order to collect saliva. Malloizel, 1902a: "On the advice of M. Victor Henri, I resumed the detailed study of salivary secretion, in order to analyze the nervous mechanism of this function".

[29] The nerve physiology work by V. Henri was carried out using nerve sutures. A bibliography of V. Henri's work prior to 1902 is included in *Rapport sur le prix de la fondation X... [sic] pour l'année 1900–1901, au nom d'une commission composée de MM. Giard, Malassez et J.-V. Laborde, rapporteur* (*C.R. Soc. Biol.*, 1901, p. I–III). V. Henri completed a second thesis in the laboratory of A. Dastre and became assistant director, before holding various chairs of chemistry in Europe.

[30] "It was reading Pawlow's [sic] lessons on "The Work of the Digestive Glands" that gave us the idea for this research". "I would also like my laboratory friends and in particular Dr. Victor Henri, to whose collaboration I owe much of my experiments, to accept the expression of my sincere friendship", Malloizel, 1905, p. vii.

[31] A. Dastre was interested in fistulas, and he described the operation for a permanent biliary fistula in 1890. Dastre, 1890.

L. Malloizel's experiments, carried out alone or with Victor Henri, did not focus on the study of conditioning, but on physiological problems such as the quality, quantity and chemical analysis of saliva enzymes (diastases) as a function of various stimulants, including psychic stimulants. This had also been a perspective of I.P. Pavlov. As for him, Victor Henri pursued this line of research on his own, carrying out almost exclusively enzymatic analyses[32], while advising L. Malloizel to use his dogs which had been fitted with permanent fistulas to carry out nerve sectioning and suturing experiments like those he had previously performed himself[33].

However, in this work, L. Malloizel did not fail to notice, as I.P. Pavlov himself had in 1898, that his dogs reacted to psychic perceptions such as sounds with a quantifiable salivary secretion in a two-page note published in 1902[34]. This work was therefore published before the first presentation of I.P. Pavlov's project in 1903[35]. L. Malloizel noted in passing: "The sound of two lumps of sugar clinking together in the pocket of my apron provokes in the same dog a secretion analogous to that of sugar. The sensory nerve excited here is the acoustic nerve; in the other cases it was the optic nerve or the olfactory nerve; but always a very clear psychic act is united with the sensory reflex"[36].

At this stage, L. Malloizel and I.P. Pavlov were apparently almost at the same point on the subject of conditioning factors. But from then on, the two schools diverged. While I.P. Pavlov launched the great international adventure of his research perspective, L. Malloizel, in his 1905 thesis, more modestly departed from the Pavlovian epistemological perspective of 1903. He interpreted his results mainly in terms of mental states, speaking of salivation by "auditory image" or "visual image", in contrast to I.P. Pavlov's recommendations. According to Jean-Claude Lecas, L. Malloizel followed the perspective of physiologist André Mayer (1875–1956)[37].

To understand how this perspective differed fundamentally from that of I.P. Pavlov, we need to go back to his 1906 *Huxley Lecture*, in which he set out his recommendations for the scientific study of psychic faculties through natural science. I.P. Pavlov demanded that he and his students confine themselves solely to "the operation of the human mind directed toward [the study of] nature, which generates explanations or ideas that are only derived from sources in the phenomena of nature present in our environment"[38]. For I.P. Pavlov, however, the concept of mental image was a purely psychological concept, which he considered to be outside the natural sciences.

Thus, I.P. Pavlov's perspective and that of conditioning, as it emerged in France, rapidly distanced themselves from their beginnings. L. Malloizel's interpretation met with the interest and support of French psychologists and physiologists. A. Mayer had already supported the interpretation of salivation by "auditory image" or "visual image" in a study on the role of images in secretions, published before L. Malloizel's thesis and referring to I.P. Pavlov's

[32] Henri, 1903.

[33] V. Henri's nerve suture experiments were published in *CR Soc Biol* in 1900 and 1901.

[34] Malloizel, 1902b.

[35] Pavlov, 1904.

[36] *Ibid.*, p. 762.

[37] Lecas, 2011, p. 123.

[38] Pavlov, 1906.

work described in 1903[39]. A. Mayer called this phenomenon a "psychic secretion" based on an unconscious "glandular reaction produced by a sensory image", in which the sensation triggering the reflex was "very indirectly associated with the excitant", as in I.P. Pavlov's conditional reflex. According to A. Mayer, this type of reflex depended on brain centers and the association of a state of consciousness with an "excitatory image"[40].

In this study, A. Mayer revisited I.P. Pavlov's research on the digestive glands, for which he had just been awarded the Nobel Prize in 1904, because he wished to present I.P. Pavlov's later work and that of L. Malloizel in their general perspective.

It is thus possible to consider how A. Mayer distinguished between the two perspectives, digestion and the conditional reflex. Mayer began by summarizing I.P. Pavlov's conception of the general principle of the mechanism of digestive tract movements: "It is the food itself, when it has reached the last degree of transformation to which a segment of the digestive tract can lead, which provokes the movements destined to make it pass into the next segment"[41]. For example, once the ingested food undergoes mastication and imbibition with saliva enzymes in the mouth, it is swallowed by oesaphageal movements to end up in the stomach. The same process occurs in the stomach before food passes to the duodenum and so forth. In I.P. Pavlov's work, A. Mayer distinguished between different mechanisms of digestive tract movements: direct mechanical mechanisms (mastication), humoral (endocrine, secretion of insulin) mechanisms and nervous regulations (salivation induced by the sight of food). For A. Mayer, the work of L. Malloizel and V. Henri fell into the latter category. It was here that he was able to cite L. Malloizel's 1902 experiment illustrating psychic factors and relating to the concept of "psychic secretion" also developed by I.P. Pavlov[42].

A. Mayer then defined a "glandular reaction produced by a sensory image" (salivation induced by the memory of a past sensation / by a mental state) in opposition to the Pavlovian conception (conditional stimulus / no mental state). Mayer's description was to become a classic in France, as ten years later he expanded his view in Georges Dumas's *Traité de psychologie* (1866–1946)[43], making a series of classic distinctions: (1) the one between unconscious or more or less conscious secretory (or glandular) reflexes; (2) the one between an excitant leading to the reflex through a normal sensation (sensation of food in the mouth or noises when food is brought in) or not ; (3) the one between an abnormal sensation *occasionally* associated with the excitant (such as the sound of a bell in Pavlov's conditional reflex) and an abnormal sensation *very indirectly* associated with the excitant (such as a word spoken in Pavlov's provoked reflex). For A. Mayer, these latter reflexes depended on brain centers through "the association of a state of consciousness with the excitatory image [gustatory, visual or auditory]", which lasted, according to him, "for a certain time"[44].

The situation was very different in the United States, where psychologists undertook conditioning experiments in the Behaviorist movement. In France, Pavlovian studies did not develop much, due to the eclecticism of the schools of psychology, which did not reject

[39] Mayer, 1904.

[40] *Ibid*.

[41] *Ibid*., p. 256.

[42] *Ibid*., p. 260. A. Mayer writes: "Let two lumps of sugar be shocked together [...] without showing them [to the dog]. Here, a specific saliva drops from the orifice".

[43] Dumas, 1923–1924. Chapter V, Excitation psychique et sécrétion, p. 539–571.

[44] *Ibid*., p. 547.

L. Malloizel's idea of the causality of mental states on physiological phenomena[45]. The result was a gradual distancing of the French physiology and psychology of conditioning from its classical study which continued in the USSR.

3. Neurophysiological approaches of conditioning in France distancing Soviet Pavlovism

This distance became even clearer in the 1930s and 1940s with the work of Wladimir Drabovitch (1885–1943), a physiologist who emigrated from Russia to Paris and was a former pupil of I.P. Pavlov. We also need to examine this work in detail and explain Drabovitch's project in its new very specific context.

As an assistant in the general physiology laboratory at the Sorbonne[46], W. Drabovitch began a series of studies on the mechanisms of the conditional reflex in A. Dastre's laboratory which had been run by his pupil Louis Lapicque (1866–1952) since 1919, following Dastre's tragic death. For W. Drabovitch, the study of these mechanisms was to provide an understanding of the formation of "temporary connections" in I.P. Pavlov's terminology, by "the making of new neuronal paths" according to L. Lapicque's expression[47]. For W. Drabovitch, this study represented the "most important, [and] most exciting" question in the study of Pavlovian conditioning, whereas he felt that Pavlov's school, to which he had belonged, "didn't even ask [it]"[48].

This difference in projects marked a clear distance between the French and the Soviet physiological schools, which was to become even more marked from then on and until the mid-1950s. As a faithful pupil of I.P. Pavlov, W. Drabovitch had brought the Pavlovian conditioning technique to the Sorbonne[49]. In the course of his work, he progressively interpreted his results within a broader framework than that retained by I.P. Pavlov, using the interpretative syncretism found in A. Mayer's work and that of French psychologists, psychophysiologists and other physiologists[50].

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[45] Barbara et al., 2011, p. 15. See in particular Lecas, 2011, p. 103–133.

[46] W. Drabovitch had won a research grant to work in Louis Lapicque's laboratory. See Ohayon, 2012.

[47] For Louis Lapicque, new neuronal paths were not created by the law of least electrical resistance of neuronal circuits accepted by S. Ramón y Cajal. They were rather functionally established according to him by the law of *isochronism*, i.e. when the chronaxies (excitabilities) of two anatomically (but not physiologically) connected pathways became identical through a mechanism of physiological regulation by the nerve centers.

[48] Drabovitch, 1937b, p. 93–94.

[49] Drabovitch, 1937, preface, p. 4–5. L. Lapicque writes: "With Drabovitch, we chose the motor reflex of a limb [...] Of course, without Pavlov, we could have trained a dog to bend a leg and investigated what happens to the chronaxies of this limb, but I had the opportunity to observe that the technique of Pavlov's school, as brought to us by Drabovitch, constituted for our phenomena a determinism whose equivalent it would have been very laborious to reconstitute".

[50] Ohayon, 2012.

Settling permanently in France before the Bolshevik revolution around 1914[51], W. Drabovitch had studied psychology with Pierre Janet and Henri Piéron, and became a journalist to earn a living. Ten years later, in 1926, W. Drabovitch was still in contact with his former teacher with whom he had worked for a year in 1913–1914[52]. He tried to convince I.P. Pavlov and neurophysiologist Louis Lapicque to undertake chronaxy[53] measurements in animals using the techniques of the Parisian neurophysiological school, with the aim of explaining the physiological mechanism of the conditioning process[54].

W. Drabovitch finally obtained an assistant's grant from L. Lapicque, and the experiments were carried out during the period 1933–1937, in collaboration with L. Lapicque's students and assistants, Albert Chauchard and his wife Berthe Chauchard. The latters were able to give W. Drabovitch the benefit of their new method for measuring the chronaxies of the cerebral cortex, which could be used before, during and after the conditioning[55]. According to Jean-Claude Lecas, these measurements carried out on dogs were not very conclusive, and L. Lapicque himself considered them to be no more than an initial approach, poorly explanatory to the phenomenon of conditioning[56].

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[51] *Ibid*. W. Drabovitch worked at the physiology laboratory of sensations at the *Collège de France* with Henri Piéron in 1912 on the latency of the plantar reflex. Drabovitch, 1914. This work is quoted in Piéron, 1914. W. Drabovitch is listed as living in Paris in the 1915–1916 yearbook of the historical and philological sciences section of the *École pratique des hautes études*.

[52] Drabovitch, 1936, p. 6.

[53] Chronaxy is the time duration of an electric current of standardized amplitude necessary to excite a nervous tissue experimentally.

[54] According to a French press report I.P. Pavlov himself insisted that L. Lapicque carry out these experiments. This is undoubtedly partly true, and it must have been L. Lapicque himself who relayed the information to a journalist (*Le Journal*, May 1st, 1934, p. 8: *À l'Académie des Sciences — Réflexe et activité cérébrale*). The journalist writes: "Pavlof [sic] drew valuable psychological notions from his experiments, but he had never succeeded in explaining the formation of conditional reflexes. And he asked M. Lapicque in vain to do so by means of [the concept of] "chronaxy", which is the specific law of the nervous current. Thanks to the collaboration of one of Pavlof's [sic] assistants, M. Drabovitch, and M. and Mme Chauchard, from the physiology laboratory at the Sorbonne, this reconciliation of two experimental theories has begun to be achieved, and this is the important news that M. Lapicque announced yesterday at the *Académie des Sciences*, adding that it will cast a bright light on our cerebral life."

[55] Louis Lapicque's first note to the *Académie des Sciences* was summarized in the French press. For example, see *L'Œuvre*, May 1st, 1934, p. 8, or the *Journal des débats politiques et littéraires*, May 2nd, p. 4. The note in question is Drabovitch, 1934.

[56] L. Lapicque wrote in the preface to Drabovitch 1937a: "Drabovitch thinks that in this way the conditioned reflex is explained. I am more demanding; I would like to know by what mechanism the peripheral and cerebral chronaxies are simultaneously and harmoniously modified. But the fact noted by the Chauchards and Drabovitch, undoubtedly represents an important factor in the phenomenon under study, and it is of interest even beyond the question of the conditioned reflex. Or rather, the conditioned reflex is here, as Pavlov would have pointed, a pathway to the general knowledge of brain functioning [...] Contrary to Pavlov's principles, I thought I had gained some insight into this interpretation by making a comparison with consciousness and the will in man; indeed, I believe it will be necessary, sooner or later, to establish such a junction. Pavlovian abstraction has been a legitimate method and has provided a fruitful stage, but in the end it will be necessary to return to the essential problem of the relationship between psychology and physiology", Drabovitch, 1937a, preface by Louis Lapicque, p. 5–6.

What is of interest is whether or not W. Drabovitch, a faithful pupil of I.P. Pavlov with whom he maintained regular epistolary contact[57], was inspired by French psychology, as L. Malloizel had been by Victor Henri (1872–1940) and his masters Alfred Binet (1857–1911) and Georg Elias Müller (1850–1934)[58].

It is undeniable that, like L. Malloizel, W. Drabovitch, although close to I.P. Pavlov, also turned away from his rigid interpretative framework. This can be seen in his descriptions and interpretations of the variations in chronaxies in animals through the "delayed" or "retarded" conditional reflex described by I.P. Pavlov[59]. For Louis Lapicque, W. Drabovitch seemed in this respect "quite unfaithful to the doctrine of his master"[60]. In fact, in his experiments, W. Drabovitch was studying a voluntary movement which he himself described as "active", i.e. as being motivated, contrary to Pavlovian practice[61].

L. Lapicque's judgment is in line with his own epistemological position, as stated at the start of his 1942 book *La machine nerveuse*, in the series of introductory statements relating to the study of the nervous system: "We can, we must, as physiologists, enable the data of consciousness to enter our mind and combine them with our own data"[62].

Later on in his book *La machine nerveuse*, Lapicque criticized Pavlov's school: "The data of consciousness are applicable to animals. It seems to me wrong that various physiologists have systematically discarded these data when they wanted to study the highest nervous functions"[63].

As for him, W. Drabovitch was equally clear in his adoption of a similar position. In fact, he explicitly criticized Pavlov's work philosophically and epistemologically as early as 1937, while generally praising it[64]. It is therefore permissible to think that L. Lapicque and W. Drabovitch independently agreed on this point.

It is also questionable whether W. Drabovitch could have adopted the views of his masters Pierre Janet and Georges Dumas. But in his 1931 article entitled "*Le sort de la person-*

[57] W. Drabovitch was also able to meet I.P. Pavlov during his visit to Paris in the autumn of 1930.

[58] Nicolas, 1994.

[59] The use of this type of reflex enabled physiological measurements to be taken. See Drabovitch, 1934, p. 1719.

[60] Louis Lapicque then added: "I would not blame him", La machine nerveuse, Paris, Flammarion, 1943, p. 245.

[61] Louis Lapicque commented mischievously on W. Drabovitch's use of the term "active", pointing out that for his pupil it meant "an act dictated by the desire to obtain a result", Lapicque, 1943, p. 245.

[62] *Ibid.,* p. 11. Lapicque goes on to take the example of the will, *Ibid.* p. 12. He concludes on this point as follows: "Therefore, when we see, from the outside, the behavior of a vertebrate resembling that of a human being, we must be slaves to a rigid metaphysical dogmatism to refuse to admit that, seen from the inside, this behavior implies analogous psychic phenomena", *Ibid.,* p. 13.

[63] This expression alludes to those used by Pavlovian Russian psychologists and physiologists, such as "higher nervous functions" and "higher nervous activities".

[64] Drabovitch writes: "Look at Pavlov. His theoretical ideas were formed during his youth (the 1870s), under the influence of the scientific philosophy and psychology of the time. It was a particular form of scientific philosophy. It has aged. So did the purely associationist psychology of the time". W. Drabovitch, 1937b, p. 8.

nalité" [The fate of personality][65], W. Drabovitch adopted an even more consensual point of view than P. Janet, and even criticized him for a certain excess of behaviorist attitude[66].

It would seem, then, that it was Pavlov's pupil W. Drabovitch who consciously and actively devised an epistemological framework for physiological interpretations of psychological concepts, and *vice versa*. However, it must also be recognized that the positions of P. Janet and I.P. Pavlov were not as fixed as might have been assumed. For, on the one hand, contrary to what W. Drabovitch wrote, I.P. Pavlov still regarded P. Janet as a neurologist, psychiatrist and psychologist, focusing above all on the "psychological stage" and developing "very particular mechanics", i.e. non-physiological ones[67]. On the other hand, in the 1930s, when he had turned to the study of psychiatry to contribute to this field from a physiological point of view, I.P. Pavlov had departed from his essentially naturalistic trajectory and considered the psychological explanation to be entirely valid, but to lead sooner or later to a physiological explanation, itself reducible in the end, according to him, to the chemical, then physical, explanation[68].

It was in this new context of the 1930s that W. Drabovitch began his measurements of chronaxies during the formation of a conditional reflex. But this Pavlovian research theme was also rooted in the Lapicque school's theoretical framework of the general functioning of the nervous system in animals and humans. Indeed, at the same time, another of L. Lapicque's doctoral students, Pierre Mollaret (1898–1987), was carrying out the same type of measurements as W. Drabovitch to study the influence of posture on muscular chronaxies[69].

The theme of P. Mollaret's research was in fact in line with the work of L. Lapicque's school on changes in chronaxies attributable to the effects of cerebral nerve centers in animals, but also in humans, in parallel with the work of neurologist Georges Bourguignon (1876–1963)[70]. The variability of chronaxies in voluntary movement as a function of agonist or antagonist muscles was found in both animals and humans. This confirmed the doctrine of the subordination of chronaxies and Lapicque's concept of "dynamic chronaxies"[71]. In

[65] Drabovitch, 1931.

[66] Although W. Drabovitch recognized that for P. Janet, this was above all a matter of experimental method, which did not prevent him from using terms such as "intention", "scheme in the mind", "dreaming", "representing", W. Drabovitch, 1931, p. 419.

[67] Pierre Janet published an open letter addressed to him by Pavlov, Pavlov, 1933, p. 853–854. For Janet and Pavlov, schizophrenic patients with a feeling of influence confuse "contrary notions", leading them, for example, to insult while feeling insulted, or to want to be alone with the conviction that someone else may have entered their locked isolation room. Pavlov, 1933, p. 850. Pavlov acknowledges Janet's "very interesting psychological analysis", *Ibid*. p. 850. However, he proposes a "physiological" explanation for this confusion of "contrary notions", *Ibid*. p. 851. Pavlov also criticizes Janet for using yet "rather complicated combination of feelings" to explain the "contrary notions" involved in "feelings of influence". Ivan P. Pavlov, Les sentiments d'emprise et la phase ultra-paradoxale, Lettre ouverte au professeur Pierre Janet, *Journal de psychologie normale et pathologique*, 1933.

[68] Pavlov, 1933, p. 854.

[69] P. Mollaret was a neurologist at *La Salpêtrière*, close to his master, the neurologist Georges Guillain (1876–1961). Mollaret, 1934.

[70] G. Bourguignon had also been a pupil of L. Lapicque. Bourguignon, 1935.

[71] *Ibid*. Lapicque explained the plasticity of the brain and learning mechanisms by the regulation of nervous paths which would tend to be functionally linked when their chronaxies would become identical due to the modulation of one of them by nerve centers. These chronaxies subject to

the particular case of W. Drabovitch's experiments with dogs, L. Lapicque suggested reproducing a similar experiment in humans to the young Romanian researcher from Bucharest, Florian Cavociu Ulméanu (1903–1973), a sports physiologist preparing his doctorate under his supervision[72].

These projects of L. Lapicque's laboratory were extended to human studies, and ultimately led to unexpected facts. Indeed, it soon became apparent that the measurements led to opposite results between animals and humans. L. Lapicque then attempted an explanation: "In humans, the first signal awakens the idea of movement, hence the preparation for movement consisting of a reduction in chronaxy, a reduction observed in dogs at the moment of execution. But such interpretations take us out of the realm of objective facts; they are rather hypotheses that call for further research"[73].

Therefore it appears that for L. Lapicque as well as W. Drabovitch, conscious voluntary movement in humans was based on different mechanisms compared to animals, which called for an interpretation from both a psychological and a physiological point of view.

This situation of a psychological phenomenon that could be interpreted in both ways was also close to that encountered in I.P. Pavlov's open letter to P. Janet[74], although Pavlov's intention here was only theoretical. I.P. Pavlov had written to P. Janet about psychiatric patients who confused insulting with being insulted, or wishing to be alone with feelings of invasion by strangers in their locked isolation room. In his work on such notions of "opposites" (*contraires*), blurring together in some patients, P. Janet had developed psychological interpretations such as the notion of "overall conduct of the insult", explaining the contrary notion of insulting by the fear of being insulted and the loss of negative control that drove the patient to insult. But on this point I.P. Pavlov had a physiological hypothesis that seemed to him very appropriate. In dogs subjected to animal hypnosis and conditioning, Pavlov's school had demonstrated states of inhibition generated with cortical excitations induced by strong sensory stimulations, and conversely states of excitation triggered by weak excitations. Thus, I.P. Pavlov did not hesitate to propose a similar neuronal mechanism to P. Janet in order to explain human psychological phenomena such as those observed in psychiatric patients.

Similarly, it was possible for W. Drabovitch and L. Lapicque to adopt a similar attitude in the study of non-pathological psychological phenomena in human voluntary movement. But in their case, they designed experiments to understand the physiological differences observed between humans and animals, and to interpret them as a physiological mechanism modifying the states of excitation and inhibition through nervous regulation of chronaxies. However, in contrast to I.P. Pavlov, W. Drabovitch and L. Lapicque also interpreted these physiological differences in humans by bringing the will or consciousness into play as hypotheses for physiological investigation.

In fact, I.P. Pavlov was aware of the possibility of discrepancies between human and animal experiments and he feared them above all in his researches at the turn of the 20th century. This is why I.P. Pavlov chose to eliminate this possibility by first working on the uncontrolled psychic reaction of salivation in dogs, because he was expecting that a vol-

nervous regulation ("dynamic chronaxies") were thought as under the control of the nerve centers (subordination of chronaxies).

[72] Drabovitch, 1937a, p. 6.

[73] *Ibid.*

[74] See note 67.

untary movement in humans might lead to complex physiological phenomena involving psychological processes.

As far as they were concerned, W. Drabovitch and L. Lapicque were equally aware that the study of voluntary movements in humans could lead to complex experimental phenomena. But this was far from frightening them. On the contrary, both were keen to see their physiological findings applied to the study of conscious, voluntary human actions. In fact, the very physiological experimentations initially dismissed by I.P. Pavlov were not at all foreign to W. Drabovitch, and it had been so for a long time.

Indeed, as early as 1912, W. Drabovitch had begun his training as a physiologist in the laboratory of Vladimir Bechterev (1857–1927)[75], before joining I.P. Pavlov's laboratory the following year. W. Drabovitch had trained in V. Bechterev's lab to study the "conjunctive reflexes", i.e. acquired reflexes like those of Pavlov's school, but concerning a motor reaction that could be voluntary. Henri Piéron, with whom W. Drabovitch had shortly afterwards reproduced the experiments observed in V. Bechterev's lab, considered the "conjunctive reflex" to be a *voluntary* motor reaction. Both Bechterev and soon French psychologists saw the "connective reflex" as an important tool that Russian-born psychologist Nicolas Kostyleff (1876–1956) had introduced in France[76]. This is how the psychological and physiological study of voluntary movements naturally developed in France, in various laboratories linked to the Russian schools of I.P. Pavlov and V. Bechterev, in a way that distanced it from the original Pavlovian epistemological perspective.

Therefore W. Drabovitch was in an almost ideal position to stop opposing psychology to physiology, as I.P. Pavlov had done from a purely theoretical point of view only. In Paris, N. Kostyleff defended W. Drabovitch's opinion with equal strength. Kostyleff, then a lecturer at the *École pratique des hautes études* in the pathological psychology laboratory directed by Pierre Marie, had published several works in French on psychology since 1903. His main message was the unification of psychology around Russian objective physiological psychology, taking into account data from introspection and mental states[77].

Such a position had been further developed in France by a Russian-speaking pupil of psychologist Georges Dumas, Marcelle Dontchef-Dezeuze (1853–1926). Dontchef-Dezeuze had made a name for herself with the publication in 1913 of a work by I.P. Pavlov under the French title, *L'inhibition des réflexes conditionnels* edited by the *Bibliothèque russe et slave*. In 1914, she published a book entitled *L'image et les réflexes conditionnels dans les travaux de Pavlov* [Image and conditional reflexes in Pavlov's work] edited by F. Alcan, in which she defended introspection as a means of pursuing the work of Pavlov's school, considering it to be "the best and most authentic proof of the existence of the mental image so often passionately debated "[78].

Thus, by the 1930s, experimental physiological psychologists had finally succeeded in Paris in following the path of the psychophysiology imagined by N. Kostyleff, M. Dontchef-

[75] See Drabovitch, 1914, p. 73: "In the laboratories of Professor Bechterew [sic], where, thanks to his kind hospitality and the kindness of Dr. Protopopoff, we were able to examine the installations and witness the experiments, it was the plantar reflex that was used in preference [for] the elaboration of connective reflexes".

[76] Kostyleff, 1910. Kostyleff translated works by V. Bechterev and tried to marry Russian psychology with French psychology. See Fedunina, 2011.

[77] On Nicolas Kostyleff, see Carson, 2012.

[78] See: Bohn, 1914, p. 154. See also: Lecas, 2011, p. 125.

Dezeuze and A. Mayer, while preserving the Russian traditions of conditioning in neurophysiological studies with the prominent roles of V. Henri of Russian origin and Russian born W. Drabovitch.

4. Distancing and collaborations around the physiological study of Pavlovian conditioning: the revival of Pavlovism in the 1950s and the birth of neuroscience during the Cold War

When after the war, from 1950 onwards, Soviet and Western researchers gradually resumed their discussions on the occasion of collaborative projects, and more freely especially after 1955 at international meetings[79], the essential question facing the international community of neurophysiologists was how to integrate the technique of Pavlovian conditioning into the modern field of the electrophysiological study of the brain, in a perspective that had previously been that of W. Drabovitch among others.

However in the 1950s, techniques had changed with the rise and progress of electronic amplification, cathode-ray oscillographs and modern electroencephalographs. Theoretical frameworks also had changed, and the concepts associated with chronaxy measurements were in the process of being completely abandoned after severe criticism in the UK and the USA in the same period[80]. The modern perspective of integrating conditioning techniques with cerebral neurophysiology led to two new goals. The first was to establish experimentally the conditioning of electrophysiological correlates of mental states. Thus, beginning in the 1930s, several researchers succeeded in inducing a low-frequency rhythmic cerebral activity[81] and then making it disappear through conditioning (by associating it with a sound, for example). The second aim was to establish experimental protocols to explain the mechanisms of conditioning, conceived as the physiological basis of learning[82].

This story occurring mainly in the 1950s unfolded in so particular and so politically a disturbed context that precise historical analyses and investigations are needed to understand how this fundamental field of neuroscience research was being set up in the East and the West, and the role played by the resumption of East-West relations[83].

In reality, the two aims described above had already emerged in the early 1930s, when the new discipline of neurophysiology had established new standards for both unitary (single neuron) and global (brain-wide) electrophysiological measurements. These possibilities opened up new perspectives for studying behavior and learning in animals through a new neuronal physiology and a new brain physiology which produced remarkable results in freely-moving animals in the following decades. According to Jean-Claude Lecas,

[79] With, for example, the *Université Claude Bernard* in Lyons (France), see: Barbara, *accepted paper*.

[80] Barbara, 2005.

[81] This slow alpha rhythm was induced in human subjects when asked to think of nothing. One of the first works of this type was by Alfred Fessard in 1935. For references to such works, see: Fessard, 1959.

[82] This was the main theme of discussions at the international colloquium organized by H. Gastaut in Marseille in 1955.

[83] These issues are examined in greater detail in Barbara, *accepted paper*.

W. Drabovitch's experiments during the 1930s were among the very first performed to use freely-moving animals[84].

This scientific adventure took on a new dimension especially between 1930 and 1955, with the emergence and adoption of electroencephalography for global electrophysiological measurements. In the early 1930s, neurophysiologists all over the world had become aware, first with amazement and then with fascination, of the possibility of recording slow cerebral rhythms on the scalps of subjects[85]. Remarkably, these rhythms could be correlated with mental states. As a result, electroencephalography developed rapidly on an international scale, also because of its great clinical interest, albeit with marked differences between countries. In the USSR, in particular, the situation was quite unusual, due to the prevalence of Pavlovism, which pushed neurophysiological research into the background.

However, this view needs to be reexamined in the light of new research, with a view to qualifying it, as the early pioneers of international electroencephalography included the Soviet researchers Semen Aleksandrovich Sarkisov (1895–1971)[86], Mikhail Nikolayevich Livanov (1907–1986) and Vladimir Sergeevich Rusinov (1903–1995)[87]. However, the situation of electroencephalography in the USSR was greatly complicated by Stalin's control over science, particularly during the Pavlov session in 1950. Although S.A. Sarkisov, M.N. Livanov and V.S. Rusinov were spared, this session seems to have brought neurophysiological research of other Soviet traditions to an abrupt halt.

The Pavlovian session was a scientific session organized by Stalin where Russian physiological sciences were discussed in the line of the Communist party ideology. Both spontaneous and directed self-criticisms of scientists, regarding the supposed inadequate approach to the following of the orthodox tradition of the Pavlov school, denounced all scientific trends related to those of the West in a purely ideological way. The session led to the condemnation of scientists, the ousting or sidelining of some and even to the imprisonment of others[88].

To understand what was at stake in this context, it is worth noting the very specific and peculiar position of Soviet physiologist S.A. Sarkisov. Sarkisov is not generally taken into account into the historiography of neuroscience, and this Russian scientist seems to have been

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[84] Lecas, 2011, p. 123.

[85] Neurophysiologists were stunned, circumspect and caught between two paradoxical feelings. On the one hand, that of having missed the possibility of such a simple measurement on a subject's scalp. On the other, the feeling that this measurement could perhaps only be an artefact. This latter feeling was associated with a certain shame relative to the former, but also with a distrust of the simplicity of the measurement and of the instrument needed to carry it out. There was also a certain distrust for the author of this measurement, the German neurologist Hans Berger (1873–1941), a follower of spiritualism and close to the Nazi party, who published electrophysiological tracings of mediocre quality in German-language journals. See Barbara, 2010, p. 116 ff.

[86] Born in Azerbaijan, active in Georgia, a pupil of Oskar Vogt in Berlin in 1925, S.A. Sarkisov was a morphologist who was the first in the USSR to take an interest in electroencephalography, following in the footsteps of Alois Eduard Kornmüller (1905–1968) at O. Vogt's Berlin Institute. As Soviet Red Cross representative in London during the Second world war, S.A. Sarkisov always had international contacts to develop his interdisciplinary approaches in the context of international neuroscience. See: Anonymous, 2019.

[87] This list is far from exhaustive. In S.A. Sarkisov's laboratories, V.S. Rusinov applied electroencephalography during the war to locate shrapnel in the brains of wounded soldiers, as well as brain tumours in patients. Sarkisov, 1945, p. 38.

[88] See for example, García-Molina & Peña-Casanova, 2022.

both discreet, very close to the Communist Party and a connoisseur of the West. A member of the Communist Party, S.A. Sarkisov graduated at the age of 28 from Moscow State University, which officially sent him, along with three other young Russian researchers[89], on an official mission to Berlin in 1925, to the laboratory of Oskar Vogt (1870–1859)[90]. Lenin had died the previous year, and Oskar Vogt had agreed to study his brain, taking over the management of a new Brain Institute in Moscow, officially founded in 1928[91]. Sent to Berlin in 1925–1926, S.A. Sarkisov had carried out microscopic studies with the aim of continuing the work on Lenin's brain, for which he signed the final report as the Institute's newly elected director in 1936[92]. For these achievements and his responsibilities, S.A. Sarkisov became a distinguished member of the USSR Academy of Sciences.

In 1950, the head of the Central Committee of the Science Department, Yuri M. Zhadnov (1919–2006), met with S.A. Sarkisov on several occasions to plan the Pavlov session[93]. According to historian Valery Soifer, Stalin had chosen K.M. Bykov to organize the Pavlov session in order to bring out a person capable of "taking charge of the direction of human physiology and restructuring research projects in accordance with party instructions and decisions". S.A. Sarkisov was approached for this task, but although it was K.M. Bykov who was later chosen, Sarkisov remained loyal to the party and was never dismissed from his charges[94]. In 1960, he was still defending the benefits of the Pavlov session in the international scientific press, alongside V.S. Rusinov and M.Y. Rabinovich[95]!

It is easy to see how S.A. Sarkisov, in the 1930s and the 1940s and beyond, was able to keep his hands free to develop the researches of his institute, and in particular those of his neurophysiology department, which he had set up and directed as early as 1928. He was also very well equipped, having benefited from a sophisticated apparatus recently built by Oskar Vogt's talented physicist and electronics engineer, Jan Friedrich Tönnies (1902–1970). Sarkisov was thus able to take advantage of a high-fidelity, multi-channel neurograph for

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[89] Richter, 2007, p. 141.

[90] Биология. Биографический справочник. Киев.: Наук. думка, 1984 [*Biologists. Biographical Reference Book*, Kiev, Naukova Dumka, 1984].

[91] The Institute was founded in 1928 at the request of V.M. Bekhterev for the histology of the human brain. It included the Brain Museum, a true "Pantheon" of brains for the study of Lenin's brain, the "extraordinary genius of the leader of the world proletariat". At the time, the institute's research activities were classified. USSR Communist Party archives indicate that Oscar Vogt actually headed the institute, and that S.A. Sarkisov was initially appointed deputy director. Archives of the Communist Party of the USSR. Microfilm Collection of the Archives of Contemporary Russian History, opis 72, Reel 1.1010, file 9. Online in the archives of California. Oskar Vogt helped found the institute and was appointed temporary director when he studied Lenin's brain. See: van Gijn, 2003.

[92] J. Richter, 2007, *op. cit.*, p. 146.

[93] Soifer, 2016, see chapter 29.

[94] Valery Soifer indicates that S.A. Sarkisov had written an article in 1950 on the doctrine of Pavlov and medical sciences in the *Газета Медицинский работник* (8 июня 1950 г., [*The Medical Worker newspaper*, June 8, 1950], p. 23), in which a competitor of S.A. Sarkisov, A.D. Speransky (1887–1961) had also written an article: А. Сперанский. Против вирховинаства и эрлихианства. *Газета Медицинский работник*, 16 февраля 1950, [A. Speransky. Against Virchowinism and Ehrlichianism. *The Medical Worker newspaper*, February 16, 1950], 7, 2–3.

[95] See: Sarkisov S.A., Rusinov V.S., Rabinovich M.Y. (1960), Book reviews, *Electroencephalogr. Clin. Neurophysiol.*, 12, 271–174.

his neurophysiology laboratory[96]. During his stay in Berlin, Sarkisov had been authorized to bring this device to Moscow as part of the collaboration between the Berlin Institute and the Moscow Brain Institute, both headed by Oskar Vogt.

This enabled S.A. Sarkisov to carry out the first Soviet electroencephalography researches in the 1930s. His studies focused on the general theory of electroencephalography, certain physiological and psychiatric aspects (narcosis), correlations between electrical activity and the histology of the cerebral cortex, and the localization of brain tumors[97].

In the 1940s, Russian electroencephalographic and neurophysiological research was temporarily diversified with Mikhail Nikolayevich Livanov (1907–1986) and Vladimir Sergeevich Rusinov (1903–1995) in S.A. Sarkisov's institute, Petr Kuzmich Anokhin (1898–1974) a pupil of I.P. Pavlov (with I.I. Laptev) and the Georgian school of Ivan Solomon Beritashvili (1885–1974). It was during this period that P. Anokhin's laboratory began the neurophysiological study of Pavlovian conditioning, and that I.S. Beritashvili also embarked on electroencephalography. However, this impetus was short-lived, and in the early 1950s the Pavlov session imposed drastic restrictions and mainly medical research with a narrow spectrum of scientific topics.

However, we must somewhat qualify this position by pointing out that M.N. Livanov and V.S. Rusinov continued to publish not only in medical fields, but also on the highly controlled theme of Pavlovian conditioning[98]. However, it is undeniable that the restrictions imposed on P. Anokhin and I.S. Beritashvili, for example, limited this field of study and caused Soviet research in electroencephalography to fall considerably behind, as was publicly acknowledged by scientists close to the Communist Party after the criticism of Pavlov's session in Kiev in 1955.

Although Soviet and Western physiologists were able to resume scientific contacts after the war from 1950 onwards, exchanges were rather limited at first, with each side reporting on its work in very different scientific, ideological and political contexts[99]. While the Soviets agreed with the Pavlov session's line of thought that neurophysiological research could provide secondary physiological clues that could only be interpreted by Pavlovian theory, Western neurophysiologists were interested in the electrical recording of deep brain areas, little studied by the Pavlov school, to explain conditioning and learning.

But from 1955 onwards, things gradually changed, even if the critical positions of the Pavlov session were still the order of the day. When V.S. Rusinov and M.Y. Rabinovich presented their report on electroencephalographic research at the Marseille colloquium organized by Henri Gastaut, they again criticized the use of electroencephalography without a sufficient theoretical framework, which in their view led their Western colleagues to simplistically correlate electrophysiological indices with mental states from a perspective deemed idealistic and lacking in rigor[100].

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[96] Richter, 2007, p. 146.

[97] For references see: Rusinov et al., 1958.

[98] However in the 1945 review of his laboratory work, published in a British journal, S.A. Sarkisov made almost no mention of the electroencephalographic work on higher nervous activity, with the excuse of the lack of space. Sarkisov, 1945.

[99] See: Barbara, *Accepted paper*.

[100] Rusinov & Smirnov (1957). In fact, this was the perspective of the neuroscience of the time and even still now when neuroscientists correlate brain activities with concepts such as pleasure, attention or anxiety.

V.S. Rusinov and M.Y. Rabinovich also drew up a historical overview of Soviet research into the neurophysiology of conditioning, then almost totally unknown to the Western physiological community, which aroused a great deal of interest.

It was at this point that P. Anokhin began publishing articles in his own name on the electrical activities of the basal brain areas and their involvement in conditioning. The 1958 Moscow symposium was an opportunity for him and for other Soviet physiologists to publicly acknowledge that, contrary to what some physiologists close to the Communist Party still thought, Soviet physiology had fallen considerably behind, and that it had to contribute once again to the development of neuroscience research by building on the Pavlovian heritage, but within the framework of the new techniques and discoveries of the international neurophysiology.

This is what French neurophysiologist Alfred Fessard (1900–1982) reminded in 1959 when he reported on the new discoveries of the French neurophysiological schools, combining "Pavlovian reflexology" with "experimental neurophysiology"[101]. These discoveries, along with those of other researchers around the world in the late 1950s, now including distinguished Soviet neurophysiologists, opened up a new path that would further develop, in A. Fessard's words, "to the point of undermining [...] the rigidity of Pavlovian dogmatism among Russian physiologists", for example, with regard to the new roles accorded to the basal regions of the brain[102].

We can thus conclude that Pavlovism, born in the context of international physiology and particularly in France, developed in close interaction with the West, then gradually distanced itself from it as much because of I.P. Pavlov's restricted epistemological foundations as because of Stalin's desire to control science by promoting scientists who were subservient to him, resulting in the catastrophic impoverishment of research themes after Pavlov's death. This slow, inexorable distancing was initially countered by the efforts of French neurophysiologists such as Henri Gastaut and Alfred Fessard within international institutions and later by Russian scientists themselves. Indeed, it was within these new institutional frameworks that scientific exchanges were able to resume without the underlying ideological parasitic debates, which nonetheless took on increasingly subtle forms of epistemological enunciation.

Gradually, the attraction of new techniques and new results accumulating and constituting attacks on some of the foundations of Pavlovism, brought researchers from East and West together once again in the new federating program of neuroscience, with the United States as the new emerging international leader with its *Society for Neuroscience*, created in 1969, which has enabled and continues to enable international cooperation on the largest scale, including in the current context where neuroscience is taking on considerable development in Russia[103].

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[101] A. Fessard, 1959, p. 88 ff.

[102] *Ibid.*

[103] Дежина И., Нафикова Т. Мировой ландшафт нейронаук и место России [The worldwide landscape of neuroscience and its place in Russia], Мировая экономика и международные отношения, n°64, 2020, p. 37–47 (in Russian).

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Внедрение «павловизма» во Франции, его изоляция в СССР и возобновление научных обменов между Францией и СССР в межвоенный и ранний послевоенный периоды

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В статье анализируются французско-российские научные отношения в области физиологии мозга и нейронаук, касающиеся центрального вопроса павловизма, его зарождения, рецепции и распространения во Франции, а также его дистанцирования от научных течений французских психологов и физиологов, включая бывших русских учеников И.П. Павлова. Эти вопросы рассматриваются с эпистемологической точки зрения, что также необходимо для понимания того, как эти научные отношения были возобновлены в 1950-е гг. в рамках сложного политического контекста. Мы анализируем, как обмен мнениями по павловизму и в целом по нейронауке постепенно исключал идеологическую озабоченность и жесткие теоретические позиции в контексте создания Международной организации мозга и нейронауки как международного исследовательского направления.

Ключевые слова: нейронаука, И.П. Павлов, Франция, Россия, холодная война, В. Драбович, Л. Лапик.