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Article

Considerations about the Origins of the French Style in the History of Sciences

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Abstract:

This paper aims to reconstruct some steps of the emergence and consolidation of the so-called French style in the history of sciences, from the perspective of Georges Canguilhem, one of its main exponents. It begins with a brief characterization of this style, then seeks the moments in Canguilhem's work in which he defines the more significant contributions of certain authors to the development of this style. First, Fontenelle's critique of Cartesian thought; after Comte and Claude Bernard, passing by Montpellier School and Paris School of Medicine, until finally reaching the decisive contribution of Bachelard.

Keywords: French style; Historical epistemology; History of sciences; Life sciences

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> Let it be permitted to see, in such a philosophical conception of the history of sciences, the source of what was and what should remain, in our view, the originality of French style in the history of sciences.
>
> Georges Canguilhem (2002 [1958], 63)

A Brief Characterization of *French Style* in the History of Sciences

Some of the authors associated with the so-called French style in the history of sciences made themselves refer one to another, prioritizing the characteristics that would be common to them. In an attempt to distinguish it from other styles in epistemology, like the analytical or the sociological, a recent historian of science and philosophy such as Jean-François Braunstein sought to feature some of these characteristics. According to him, the originality concerning the French epistemology is that it "starts from a reflection on the sciences, this reflection is historical, this history is critical, and this history is also a history of rationality" (Braunstein 2002, 3). Starting from a reflection on the sciences means to refuse, in advance, that epistemology should be a theory of knowledge, i.e., that it should postulate an external method to science, oblivious, by being external, from the inner historical becoming that

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constitutes certain discipline as a science. By the way, in order to perceive the scientific method as the permanent transformation that it genuinely is, it is necessary to follow the development of some specific science, it is necessary to be contemporary to it. Hence, as Bachelard sentenced, it is necessary to practice this science. In doing so, the scholar of certain science will accompany and reconstruct its history, asking itself about the conditions for the emergence of the scientific discoveries referred to this science at the moment when they happened, not being satisfied with later justifications. This inevitably raises the problem of the objectivity of scientific knowledge, which can only be reconstructed reflexively or critically. This reflection will end up forcing the attribution of a certain value to the knowledge production process, according to the current perspective referred to the science that this scholar is practicing. This retrospective gaze cast by the current status of science on its own paths displaces the requirement for factual objectivity in the recomposition of the history of sciences in favor of a *recurrence* attributing a new meaning to the past. The *recurrence* transforms what could be a mere accumulation of curiosities or meaningless anecdotes in an epistemology: a critical knowledge about a present and constituted science that gives meaning and value to the paths of this science. In the end, it is hoped that this critical history can serve as an index of rationality itself, even if it is to criticize its criteria and scientific bases, as in the case of Foucault's archeo-genealogy.[2]

Another aspect that singularizes the French style is that, although it is developed according to specific regionalities (e.g., set theory in mathematics, Einsteinian physics or quantum chemistry, cell theory or embryology), sciences always appear as a privileged place for the development of reason itself. It is no relativism to say that each science develops a method concerning its own object. On the contrary, it would be betraying the development of any science attributing, from the outside, a common unity or rules that do not come from inner epistemological requirements. This does not exclude, however, that there is a role for philosophical questioning, and this may differ more or less in each author considered: a reflective or critical role that does not intend to rival the discourse of science because it does not intend to pronounce truths.[3]

Canguilhem seems to have been the last survivor of the old generation of French epistemologists who practiced this style. After he died in 1995, the interest in his thinking and the historical epistemology he represented significantly decrease, a fact for which J.-F. Braunstein (2016, 161-162) presents at least two reasons: 1) the appropriation by the Althusserians (D. Lecourt, P. Macherey, É. Balibar),[4] who wanted to find elements in his work for the constitution of historical materialism as science, which ended up submitting his reception to this domain; 2) the import, in France, of the analytical method in philosophy of science, which occupied the space previously belonged by authors who practiced a French

[2] In Luca Paltrinieri's (2012) comment on Foucault, for example, very attentive to the recent transformations in the philosophical and epistemological fields, the Canguilhemian "epistemological history" appears associated with Foucault's archeo-genealogy as a tool to analyze the emergence of the concept of population, in its relation to the "probabilistic style" approached by Ian Hacking (1975). We can find another example in Vera Portocarrero (2009).

[3] We can think about the debate organized by Dina Dreyfus (1965) involving Canguilhem, Hyppolite, Foucault, Alain Badiou and Paul Ricoeur. This debate begins with a sentence in which Canguilhem states that there are no philosophical truths, but only scientific truths. This would in no way deflate the tasks of philosophy, one of which being to evaluate scientific thinking and its truth-building process.

[4] The Brazilian edition of *The normal and the pathological*, for example, brings afterword the pioneering study by P. Macherey, with a presentation by Althusser, originally published in a 1964 edition of the magazine "La pensée", in which a systematic analysis of his thinking is carried out. There is an effort to say that Canguilhem's historical epistemology would have a "properly dialectical or materialistic way of proceeding" (Macherey 1964, 253).

historical style.[5] However, in recent years, an interest in Canguilhem has flourished again, inside and outside France, which is evidenced by the increase in theses and articles dedicated to his thought.[6] Let us mention, in Brazil, *The Life Sciences: From Canguilhem to Foucault* (2009), by Vera Portocarrero, *The Circuit of Affects* (2015), by Vladimir Safatle, and *Canguilhem and the Genesis of the Possible* (2018), by Tiago Santos Almeida, which could contribute to a greater diffusion of Canguilhem's thought in my country. My doctoral thesis, in turn, proposes a historical-critical approach to Canguilhem's thinking, seeking to go through the stages in which his work was constituted by applying some of the reading tools provided by this historical style. It is interesting to note that Canguilhem did not start his work as a historian of sciences. He became a historian of sciences under very specific conditions, which I tried to reconstruct, showing how some of the philosophical and epistemological problems that characterize this author's work arose. Such problems could arise, either from his own research, either from external happenings: political events, epistemological revolutions in the life sciences that Canguilhem started to practice also under specific conditions (as the discovery of DNA hereditary structure, in 1953, who renewed the studies in genetics), or new philosophical advances brought by younger thinkers (e.g., Foucault, Althusser, Dagognet or Delaporte).

Under the influence of the old generation represented by Canguilhem, there were also attempts outside France to reopen scientific thinking to historical investigations. Since the middle of the 20th century, in fact, this *French style* had already received a reception in countries like Germany, Italy and the USA. As an example, we can think about the debate held between the end of the 19th century and the first half of the 20th century on continuism and discontinuism involving Duhem and Koyré, which had its sequence in the USA with T. Kuhn, I. B. Cohen, among others.[7] More recently, an author associated with the Stanford School, such as Ian Hacking, who defines his epistemology as an "interventionist nominalism" (Hacking 1983), claims the Bachelardian heritage (which is not done, however, without producing a mutation in it), as when it presents the concept of "probabilistic revolution" (Hacking 1987): more than a scientific revolution *stricto sensu*, it would be defined by Hacking as the moment of the emergence of a new style of thinking, because "probabilism" will modify the framework of different sciences and "discursive practices" (concept closer to Foucault) that take place in the field of knowledge, such as physics, chemistry, biology, in addition to social thinking, medicine and public health.[8] Arnold Davidson, in turn, developed the theme of the emergence of a style of thinking from the notion of sexuality (Davidson 2001). And when some of these authors started teaching in France, this style was given a new lease of life, constituting a new school of historical epistemology (Braunstein 2012). It is clear, however, that this new generation is closer to the

[5] It is worth noting, in this regard, the attempt by Jacques Bouveresse (2011, 7-66), expressed in the general preface to Canguilhem's *Œuvres Complètes*, wanting to bring historical epistemology closer to the Anglo-Saxon epistemological tradition, such as that of Russell and Wittgenstein. We believe that this attempt cannot be sustained, and Bouveresse himself acknowledges that Canguilhem was not very sympathetic to this approach.

[6] This was facilitated by the progressive publication, since 2011, of his *Œuvres Complètes*, allowing access to the general public of texts with little circulation, especially those referring to the period before the 1940s. For it, the availability of his manuscripts *in loco* was also a great contribution.

[7] For the scope of the concept of the *scientific revolution* in the English-speaking world, see: Cohen (1985, 1987), Butterfiled (1968 [1957]), Hall (1954) and Hacking (1981). For a non-revolutionary perspective of science, among those who prefer a gradual or "incremental" cumulative history, see: Crombie (1953) (Koyré has debated this book in 1956 in the article "The origins of modern science: a new interpretation", republished in *History of Scientific Thought Studies*), Duhem (1896, 1905), Millikan, (1918) and Toulmin (1972).

[8] This is the subject of another of his books (Hacking 1975). On the notion of style in Hacking, see: Hacking (1992, 1994) and Sciortino (2017).

history of sciences than to an epistemology of the history of sciences. As a reaction to a thought about science that subtracts internal procedural from conceptual production and reduces it to categorical analysis, this return to history produced a new shift.

There are certainly other styles in epistemology. And perhaps the best definition of what epistemology itself is, it is that of Ludwik Fleck, when applied to itself: "the science of thought styles".[9] In this sense, also other authors tried to designate or to describe the thought styles produced in human history.[10] Regarding the specific term "historical epistemology", to which the French style is rightly assimilated, it seems to have gained the dimension that we know today from the publication of the work of D. Lecourt (1978 [1969]), entitled *L'Épistémologie Historique de Gaston Bachelard*, who was guided and prefaced by G. Canguilhem.[11] D. Lecourt (1974) was also the first to introduce Foucault to the heritage of this style, in subsequent work. As for Canguilhem, it is true that the occurrence of the term "historical epistemology" would only occur for the first time in his work in 1963, as C. Limoges noted: "It is not frequently used in Canguilhem (four occurrences only in a set of published writings) and this use is generic, applying for example to both Thomas Kuhn and Bachelard" (Limoges 2015, 40). It is also true that Canguilhem seems to have preferred the term "epistemological history" instead of "historical epistemology"; which would make a difference to Bachelard.

Another important feature of this style, which is not present, however, in all authors who are linked to it, but which appears strongly in Canguilhem, is its inflection on the domain of life sciences. This feature refers us to Auguste Comte, who ended up his work by conceiving as the most important task of philosophy to contribute to the establishment of social therapy, by using the results of science (Braunstein 1998). Since his memorial of graduation at the *École Normale Supérieur – La Théorie de l'Ordre et du Progress chez Comte* (1926) –, Canguilhem had already focused on Comte's work. Throughout all of Canguilhem's work, interest in Comte has never diminished, despite growing distrust of the political results of his thinking. In the texts in which he discusses the characteristics of the French style in epistemology, Canguilhem attributes to Comte the quality of founder of that style, on having given history a preponderant role in the constitution of scientific rationality. Its importance

[9] Fleck ended up one of his articles with the following wording: "Science of sciences is a separate science based on observation and experiment, on historical and sociological investigations. It takes part in the science of styles of thinking" (Fleck 1986 [1946], 127). We can remember here that the "science of style", the stylistic, has concerns similar to this one, which would lead us to a separate study. Gilles-Gaston Granger, for example, has attempted to carry out a general stylistic that could be applied not only to hard sciences but also to human sciences. In this sense, he defined *style of thinking* as a certain relation between form and content that is characteristic of work as "a modality of integration of the individual in a concrete process that is work" (Granger 1968, 5). Leo Spitzer, in turn, an author trained in philology, who went through linguistics and semantics before culminating in stylistics, has seen this discipline as a way of giving life to studies in pure linguistics. In linguistic studies, stylistics has had its field consolidated since the middle of the 20th century. The stylistics applied to literary history also allows reaching other aspects of social history, as Spitzer exemplifies: "What the study of Rabelaisian language showed, a literary analysis could confirm: it could not be otherwise, because language is only the external crystallization of an inner form, or to use another metaphor: the blood of poetic creation is everywhere the same, whether we approach it at the level of 'language' or 'ideas', 'narrative' or 'composition'"(Spitzer 1970 [1948], 60). The French translation of this text is by M. Foucault.

[10] A. C. Crombie (1994), for example, in a very well-documented work, described several styles of scientific and artistic thinking that have followed each other historically in the West, according to an incrementalist approach.

[11] Lecourt (2008, 51f) states that the title was suggested by Canguilhem. Braunstein (2012, 35) notes that this expression had already been used by Abel Rey, who had also said, long before Foucault, that he practiced an "archeology of scientific ideas". The term gained greater international notoriety with the publication of the German volume by Rheinberger (2010 [2007]), soon translated into English.

lies in the effort to produce a synthesis – which would eventually fail – between different lineages of French and European thought: on the one hand, a lineage of medical thought; on the other, the legacy of the Enlightenment. Comte would be the one who would first have tried to integrate these two legacies into a historical philosophy of science, which would make him, in Canguilhem's point of view, "the first and most eminent of our masters in the history of sciences" (Canguilhem 2002 [1958], 63).

The Emergence of the *French Style*: From Fontenelle to Comte

We find, in Canguilhem's work, moments when he reconstructs some segments of these lineages, going back to a more or less distant past. At a commemorative conference, for example, he showed how an author like Fontenelle (1657–1757) has his importance measured in contrast to two other authors among which his work would be found: Descartes and Comte. Canguilhem wanted to demonstrate how Fontenelle had produced a modulation in the first that would anticipate some of the innovations that would only gain its full dimension in the second. Thus, on the one hand, there would be a certain Cartesian heritage in Fontenelle, which could be seen in the "intellectual rigor", in the "contempt for the current syllogistic logic", in the "method" and the "exercise of reason" (Canguilhem 2002 [1957], 54). But such an inheritance would not concern so much the "specific mathematical requirements", but "a certain style of thinking" (Canguilhem 2002 [1957], 54). Consistently with Descartes, but without properly following his mathematical method, Fontenelle will try to overcome it, historicizing the Cartesian conquest of truth. Canguilhem wonders, however, if this historicization would not be abusive because of the limits that Descartes had established to knowledge. He then replies:

> Fontenelle had the great merit of realizing a completely different meaning to the Cartesian revolution. [...] Fontenelle, then, saw that Cartesian philosophy, when it killed tradition, that is, the unreflected continuity of the past and the present, founded, at the same time, in reason, the possibility of history, that is, the awareness of a sense of human becoming. (Canguilhem 2002 [1957], 55)

Thus, Fontenelle's work would have united two things: boldness and historical optimism. Boldness would be to make the achievements of scientific knowledge derived from historical experience. This would risk making them unpredictable in their progress, which would no longer be founded on the secure foundations on which Descartes had established it. However, such boldness would be linked to a historical optimism that is characteristic of *enlightenment*, as well as to a refusal to submit reason to an authority other than that of the subject who seeks to be guided according to his own reasons. This optimism is what would have allowed admitting "historical progress of the conditions of affirmation of the true" (Canguilhem 2002 [1957], 51). And it was this alliance between boldness and optimism that, organized according to an effort of systematicity, found in Fontenelle, if not exactly a precursor of A. Comte, at least a work convergent to that of the one who will later found, according to Canguilhem, the French style in epistemology and history of sciences:

> It can be seen that Fontenelle announces, under some relations, the theory of Auguste Comte on the correspondence of the law of the three states of spirit in the individual and the human species, as well as on the definitive character of the scientific or positive age. (Canguilhem 2002 [1957], 56)

Comte, in turn, will radicalize this battle against mathematics, even if he were a professional mathematician and only an amateur in biological matters. Thus, he will live in his own profession the discontent that made Fontenelle also deviate from the Cartesian method, replacing Cartesian dualism with another one, whose concepts have different genealogies, those of *material environment* and *vital organism*: "The dualism of matter and life", says Canguilhem, "is the positivist equivalent of the metaphysical dualism of extension and thought" (Canguilhem 2002 [1958], 67). And his ambitious theoretical attempt will consist of uniting, in a principle of balance, these two concepts, in which an immense struggle is recognized, as says Comte himself, between the "living nature" and the "whole of the inorganic world" (Comte *apud* Canguilhem 2002 [1958] 73-74). Evidently, this attempt to unite two hybrids concepts did not have an absolute origin in the founder of positivism: they are traces of a more distant heritage that he synthesizes and reformulates, and his originality consists precisely in this reformulation. The idea that life is an incessant struggle against death, according to Canguilhem, is inherited from the Montpellier School of Medicine[12] and, through it, from Bichat, author of the maxim that "life is the totality of those set of functions which resist death":[13] "Comte is as intuitively convinced as Bichat that life is a struggle against death [...], that Bichat of whom he always speaks as he does not speak of any other" (Canguilhem 2002 [1958], 74).

Thus, having inherited this vitalist conception, Comte would be faced with the enormous difficulty of synthesizing it, in a unique theory, with a conception of *physical environment* inherited from mechanics and based on the principle of energy conservation (First Law of Thermodynamics). In biological matters, this predominance of the environment over organisms was represented by Lamarck, and Comte tried to search the Montpellier School for arguments to refute Lamarckism. As Canguilhem continues, it is "from Barthez that Comte takes the grounds for his firmest reservations [...] against Lamarckism. The organism, both in terms of formation and operation, cannot be fully determined by the environment" (Canguilhem 2002 [1961], 79). And by trying to be consistent with this refusal to a fixist conception of environment, Comte broke with the Cartesian conception of extension. However, when trying to resolve this tension between two opposing and antagonistic forces, one converging towards order (the environment), the other towards progress (the living organism), Comte was forced to assume them as implicated in a unique process, namely, in totality. And as he did not manage, despite all his efforts, to break this antinomy between environment and organism, Comte ended up tipping, finally, to the primacy of order over progress, or of the environment over the organism. This would culminate, in his last great work, in the postulation of a kind of regulatory body external to humanity, a High Priest who will guide positive religion. Thus, Comte's work, which started from a scientific system on nature, will end in a religion of humanity. Canguilhem will notice how this tendency towards the mechanical and physical-mathematical conceptions of the environment, against which Comte always fought without being able to overcome them,

[12] The Montpellier School, with differences concerning each author, generally defended a vitalist conception of the organism, as an alternative to animism and mechanism. It had as main representatives: Théophille de Bordeu (1722-1776), Paul-Joseph Barthez (1734-1806) and Henry Ducrotay de Blainville (1777-1850).

[13] This statement by Xavier Bichat (1771-1802) is found in *Recherches Physiologiques sur la Vie et la Mort* (1799-1800) and it is abundantly quoted by Canguilhem, who once summed up its importance: "Bichat's essential contribution for modern anatomy consists of the generalization of a theory expounded by Philippe Pinel (1745-1826) in his *Nosographie Philosophique* (1798), for whom the pathology must be founded not on the topographic situation of the organs, but on the structure of the membranes, either that is, the tissues that make up the organs, whatever their situation in the organism" (Canguilhem 2018 [1970], 271). It should also be noted how Bichat's vitalist philosophy could have influenced Schopenhauer, and, through him, Nietzsche and Freud, among others (Canguilhem 2018 [1970], 269-274).

ended up making positivism a politically conservative philosophy. This is because, despite efforts to escape a static conception of life and nature, Comte remained still stuck in a fixative model of human nature and life: "If Comte is a mathematician due to his education, he is a biologist by the second culture and by decision, if not by destination. But the biology to which Comte refers is preformist and not transformist" (Canguilhem 2002 [1964], 98).

Without neglecting the consequences of this very moving failure in which Comte's philosophy culminated, Canguilhem will also recognize his merit of having founded the French style in history of sciences, which proposes to unite a historical perspective of sciences with a biological conception of knowledge. In Canguilhem's eyes, subsequent attempts to establish sociology, based on Comte, as a science seems to be much more condemnable. Durkheim, in this sense, is a bad disciple of Comte, because he takes to the limit the overdetermination of the environment (now named a social environment) over individual conducts. Definitively abandoning the biological domain to enter the social domain, Durkheim quickly erased all difficulties that Comte still found in overcoming the antinomy between environment and organism. In addition to Durkheimian heritage, Canguilhem will trace another one, also rooted in Comte, to which he will seek to join, reacting with that biological traces also present in positivism. This will bring Canguilhem to Claude Bernard, considered by him as the first physiologist-philosopher:

I intend to try to bring out the deep dimension of a scientific work whose style, original contribution and the lesson that can be drawn from it cannot fail, today, by comparison with the style and approaches of science that has kept the same name, reducing his ambitions, to give rise to a shock at the change of scenery, a restlessness for the difference. (Canguilhem 2018 [1967], 144)

The Contribution of Claude Bernard: "A Physiological Copernican Revolution"

Some mutations that Claude Bernard imposed on French medical thought that Comte was heir are quite significant, concerning both a radicalization of the recognition of the irreducibility of the living being and the postulation of an experimental method in biological matter. Canguilhem will frequently report on his thesis in physiology – *Recherche sur une Nouvelle Fonction du Foie Considéré comme Organe Producteur de Matière Sucrée chez l'Homme et chez les Animaux* (1853) – that had earned him the celebrity for discovering the glycogenic function of the liver and, thus, have been able to demonstrate experimentally that organism, by creating internal secretions, establishes an environment for itself (the "inner environment"[14]). Such discovery will make possible the appearance, a few decades later, of a medical-physiological specialty, endocrinology (1909), about the importance of which Canguilhem (2002 [1959]) will discuss in another of his articles. But what makes this discovery so fundamental is that with the creation of this concept of "inner environment", Claude Bernard was finally able to reverse the relation between *environment* and *organism*, the point where Comte still hesitated. This brought about what Canguilhem will call the true *Copernican Revolution*, more important than Kant's, which was still limited to the metaphysical duality between subject and object. With such an inversion between organism and environment, says Canguilhem, Claude Bernard had demonstrated "to contradictors, to backward systematics of ontology" that the principles admitted by the scientist "also found, as inevitable appearances, the phenomena on which they seek to base their objections" (Canguilhem 2002 [1965], 139). Therefore, by inverting the orbital center of physiology to "inner environment", Claude Bernard reconfigured the problems that Comte's positivism

[14] "Without the idea of internal secretion, there is no idea of the interior, and without the idea of the interior, there is no autonomy of physiology as a science" (Canguilhem 2002 [1968], 148).

had faced, without being able to solve them. It will no longer be the external environment that will regulate the organism. It is the organism itself that will be defined according to self-regulation that it provides in relation to the environment.

Besides, in a second essential work by Claude Bernard, in which Canguilhem also focuses – *Introduction à l'Étude de la Médecine Expérimentale* (1865) –, the principles of the experimental method in biology were established (Canguilhem 2002 [1965], 129), and such work can be considered, for the life sciences, as Bergson said, which was Descartes' *Discourse on the Method* to natural sciences. Unlike Comte, the conclusions of Claude Bernard are "taken from a lifetime of biological experimentation, from which the celebrated *Introduction* methodically encodes practice" (Canguilhem 1984 [1943], 32). As is characteristic of this historical style that Canguilhem himself practices, we will find in the set of his work other references that allow us to affirm the lineages and affiliations that would culminate in Claude Bernard. Evidently, this also does not exclude his originality in having reformulated the terms of problems that already appeared in some of his predecessors. This is the case of Claude Bernard's master, François Magendie,[15] to whom the need for an experimental medicine discipline is due. But, while Magendie longed to create an empirical method to aid the development of scientific medicine, Claude Bernard will institute a methodological system, a kind of "science *a priori*" founded on his new revolutionary conception according to which an organism can only be understood from the viewpoint of its interior regulation. If Magendie's method would make the apprehension of *experimental facts* possible, what Claude Bernard effectively made possible was *epistemological facts*, i.e., inherent facts in a cohesive and systemic theory that guides and coordinates the apprehension of *empiria*, a theory that can only be established *a priori*.[16]

Thus, in addition to finally having inverted the orbital center from the environment to organism, which will constitute the *foundation* of physiology as a science, Claude Bernard can also have its importance measured by the establishment of a *method* related to this new field of studies that he discovered. At this point, Canguilhem marks a distinction between two levels of scientific analysis to which correspond the two Claude Bernard's books that we have just mentioned: the first would still be considered a first level (*application* of a method); while the second would be another level (*reflection* on the method). This second-level reflection would be enough to make Claude Bernard, from a physiologist *stricto sensu*, a philosopher-physiologist:

> As a philosopher-physiologist, it is necessary to understand the physiologist who, at a given moment in a science that is already underway and on the right path, is very explicitly aware of the fact that science is above all a method of study and research, and that is given by task, expression and untransferable personal duty to give this method a *foundation*. [...] As in the 19th century, the question of the foundations of mathematics was the task of mathematicians themselves, in physiology it is a physiologist who was responsible for the foundation of his science (Canguilhem 2018 [1967], 145).

[15] François Magendie (1783-1855) belonged to the *École de Médecine de Paris* since 1807, occupying the chair of Medicine at the *Collège de France* between 1830 and 1855. Regarding his thought, in opposition to the vitalism of the Montpellier School, Canguilhem said that he "reacted strongly against the idea of a biological order separate from the physical-chemical order, against the belief in the existence of irreducible vital properties" (Canguilhem 2015 [1957], 763).

[16] In another essay, Canguilhem acknowledged to Claude Bernard the merit of having demonstrated how experimentation in itself does not constitute a science like the biology, saying: "The problem in biology, we would say, is not to use experimental concepts, but to constitute experimentally authentically concepts, biological factors" (Canguilhem 2009 [1951], 21).

These two new features introduced by Claude Bernard would lead, according to Canguilhem, to the postulation of four methodological precautions specific to the biological approach: 1) *Specificity*: according to this precaution, each animal would have its specificity, and "no acquisition of an experimental character [...] can be generalized without express reservations" (Canguilhem, 2009 [1951], 27); this would apply both to the different varieties among themselves, from species to species, as well as from animal to human. 2) *Individualization*: each species would have, in each individual, differences that would only be homogenized to the extent that a particular theory is adopted, and that theory must be recognized as concerning the scientific needs of a living being, in particular, the human living:[17] "so as in physics, the apparently naive use of an instrument like the magnifying glass implies adherence to a theory "(Canguilhem 2009 [1951], 28-29). 3) *Totality*: "In an organism, the same organs are almost always multipurpose, on the other hand, all phenomena are integrated" (Canguilhem 2009 [1951], 29). 4) *Irreversibility*: "Throughout life, the organism evolves irreversibly, so that most of its components are provided, if we keep them separate, with potentialities that are not revealed in the conditions of the normal existence of the whole" (Canguilhem 2009 [1951], 30).

Therefore, we can see that the importance of Claude Bernard, for Canguilhem, lies above all in having completed the *Physiological Copernican Revolution*, changing the relationship between organism and environment already instituted, in some way, by Auguste Comte. However, there would still be other consequences to be drawn from this radical transformation. By defining the experimental method to be used in physiology, Claude Bernard also ended up immobilizing it. Another step, concerning this method, will be taken, always according to Canguilhem, by Gaston Bachelard.

Bachelard and the Requirement of a Permanent Epistemological Revolution

However, if it is true, on the one hand, that Canguilhem will never fail to recognize the essential importance of Bernardian methodology, he will also recognize its limits. It is because for having made a kind of *a priori* deduction of the principles of his methodology, Claude Bernard ended up immobilizing them. It would then be up to him to continue his innovations and the style of thinking initiated by Comte, which was both historical and biological-therapeutic, to give movement to his method as well. This is precisely what Canguilhem will look for in Bachelard, although his epistemology bears on matter sciences, and not about life sciences. It is in Bachelard that Canguilhem will recognize as explicitly put the methodological task in according to which it is necessary to give up general principles to be able to understand the need to accompany *pari passu* the development of the specific science from which epistemology is intended:

> To Comte, who speaks of a good system of mental habits, Bachelard replies: "Scientific methods... are not the summary of habits acquired in the long practice of science". To Claude Bernard, who declares: "It is not enough to want to do experiments to do them; you need to know what you want to do, and you need to avoid making mistakes amid this complexity of studies: then you need to fix the method, and it's my chance", Bachelard replies: "The spirit must bow to the conditions of knowledge. It must create in itself a structure corresponding to the structure of knowledge. It must mobilize

[17] Later, in the same essay, the author says: "Now, the experimental method – as the etymology of the word method indicates – is also a kind of path traced by the biologist in the world of the porcupine, frog, drosophila, paramecium and streptococcus" (Canguilhem 2009 [1951], 39).

> around articulations that correspond to the dialectics of knowledge". Let's fix, says one, let's mobilize, says the other. (Canguilhem 2002 [1966], 167)

In saying this, Bachelard postulates a "demand for a permanent epistemological revolution whose Claude Bernard's work and thought", according to Canguilhem, "do not contain any index" (Canguilhem 2002 [1966], 169). Thus, Canguilhem sees a limit to the immense enterprise to which Claude Bernard joined his name. For, if we must recognize his merit of having achieved the *Physiological Revolution*, the method he wanted to institute from it prevented a permanent revolution, fixing itself in the state in which that first revolution took place. This occurred, according to Canguilhem, because both Comte and Claude Bernard ran into similar impasses because they had, behind their epistemologies, instituted political theories which they did not want – or were not able to – overcome. Therefore, in both, we will find theories that identify normal and pathological physiological states, one for its fixist conception of the environment as an external regulator of the organism, the other for its fixist conception of the method. Such will be the analyzes of Canguilhem's thesis in medicine *Le Normal et le Pathologique* (1943), the results of which he will return in his last texts when defining the theories of Comte and Claude Bernard as "scientific ideologies".

That is why Canguilhem understands the revolution operated by Claude Bernard – essential for the life sciences to become autonomous – as referring only to the order of biology, having not been extended, by him, to the "order of biological epistemology" (Canguilhem 2002 [1966], 170). Thereby, if we are to recognize the merit of having demonstrated the difference between a mere experimental fact and an authentically biological or physiological fact, Canguilhem observes that Bachelard went further than Claude Bernard did, by joining the developments intrinsic to the sciences with those of epistemology that it must accompany them, which implies give rhythm to epistemology – to speak like Bachelard. And Canguilhem will one day try to apply, in the domain that was that of Comte and Claude Bernard (that of biological sciences), tools gathered from Bachelardian epistemology. From that meeting, an attempt will be made to create an epistemological thought referring to biology that is also "non-Bernardian" (Canguilhem 2002 [1966], 170). For if Bachelard did not build an epistemology of life sciences,[18] Claude Bernard, in turn, no matter how much he sought autonomy in the biological domain, still maintained, as far as the method is concerned, a non-revolutionary posture, that is, a static or fixist posture: "As if the discovery of own laws was without influence over the concept of a general law of laws" (Canguilhem 2002 [1966], 170). And in an interview at the end of his life, Canguilhem also confirmed his rebuke of a method in epistemology that recognized himself as abstract or general, by saying: "The method is a function of its object. As the object changes, the method cannot be imported in any way. It is necessary to invent, at the same time, the delimitation of the object and how it will be approached" (Canguilhem 2018 [1984], 1004).[19] What will be

[18] In the encyclopedic entry "Vie" [*Life*], published by Canguilhem in 1973, there is an entire section dedicated to Bachelard about the obstacles to scientific knowledge of life. There, Canguilhem points out that there was, in a way, a dimension related to a reflection on life in Bachelard, although he only raised it, but that could be found in his work *Lautréamont*: "In insight of genius, Bachelard, although he did not give place in his writings to biological philosophy, discovered in *Les chants de Maldoror* that the primary obstacle to the intelligence of the biological object consists: the desire for metamorphosis" (Canguilhem 2018 [1973], 586). In addition to this "psychoanalytic obstacle", there would be yet another order of "obstacles of technical interest", the overcoming of which could be exemplified with the invention of microscopes, and their correlation with the discoveries of Louis Pasteur.

[19] At the same occasion, the interviewers (Jean-Pierre Chretien-Goni and Christian Lazzeri) said that Karl Popper's book *The logic of scientific research* presented a generalized logical view of the scientific method, valid for any and every science without distinction; and Canguilhem does not deny this

censored to Claude Bernard, therefore, is not going to the end in the task that he himself recognized to the life sciences in claiming an effectively autonomous domain, i.e., indifferent from all types of external immobility. The day will come when Georges Canguilhem will recognize this task as his own. This may make him the author who took it further, and who best coordinated, these two contributions that characterize French style in epistemology and history of sciences – the historical and the biological ones – in order to investigate the conditions of practical possibility of a doctrine of the health of life. However, this was not the result of a philosophical intuition that would manifest or develop during the author's thinking, nor was it the result of external constraints.

Finally, let us reiterate that the two main characteristics attributed by Georges Canguilhem to the French style in epistemology are: a medical inflection to scientific studies; a certain relationship with the history of science. It is not by chance that his own work begins with a reading made by Auguste Comte,[20] considered by him as the main master in the history of sciences in France. In addition, we observe how Canguilhem has traced, himself, an affiliation between certain authors of the tradition of medical thought in France, until arriving at Auguste Comte and Claude Bernard. We can also notice great originality on the part of this reading by Canguilhem about his own tradition attributed to Gaston Bachelard, and an implication of his epistemology on a scientific domain that was not exactly his own. This is also, therefore, a certain originality of Georges Canguilhem in the way he narrated what was the history of the development of the French style in epistemology, which nowadays already goes through countless other paths inside and outside France.

Conclusion

In this paper, we discussed some aspects of the construction of the so-called French style in the history of science from the perspective of one of its greatest exponents, Georges Canguilhem. We started from a brief characterization of this style, then we placed it in a medical tradition that goes back from the Montpellier School to Bichat, the latter which was enthusiastically read by Auguste Comte. We also addressed the historicization that Fontenelle did to an author like Descartes, who was also a source for Comte. Then, we approached the fundamental Copernican Physiological Revolution promoted by Claude Bernard and the contribution of Gaston Bachelard with the idea of a Permanent Epistemological Revolution. Such was how Georges Canguilhem remade this path of the constitution of the so-called French style in epistemology, which he himself would practice in his inflection to the medical and biological domain.

References

Bouveresse, Jacques. 2011. "Préface aux *Œuvres Complètes* de Georges Canguilhem". IN: Canguilhem, Georges. 2011. *Œuvres Complètes, vol. 1: écrits philosophiques et politiques, 1926-1939*. Paris: Vrin, pp. 7-66.

Braunstein, Jean-François. 1998. "Canguilhem, Comte et le Positivisme". IN: Braunstein, Jean-François; Bing, François; Roudinesco, Elisabeth (org.) *Actualité de Georges Canguilhem:*

consideration. Historical epistemology, in turn, would always have science itself as a starting point (never philosophy or epistemology), since it is from science that the methods concerning a specific object can be attributed, according to its specificity, denouncing as contrary to the sciences themselves the postulation of a universally valid method or an *a priori* method.

[20] Canguilhem's conclusion memorial at the *École Normale Supérieure*, defended in 1926 under the guidance of Célestin Bouglé, was entitled "Théorie de l'Ordre et du Progrès chez Comte". Unpublished, it is available for local consultation at CAPHÉS (Centre d´Archives en Philosophie, Histoire et Édition des Sciences, located at 29, rue d´Ulm, 75005, Paris), under the quota GC. 6.1, fl. 35.

Le Normal et le Pathologique. Actes du X^e Colloque de la Société Internationale d'Histoire de la Psychiatrie. Le Plessis-Robinson: Synthélabo, pp. 95-120.

Braunstein, Jean-François. 2002. "Bachelard, Canguilhem, Foucault: Le 'Style Français' en Épistémologie". IN: Wagner, P. (dir.). 2002. *Les philosophes et la science*. Paris, Gallimard.

Braunstein, Jean-François. 2012. "Historical Epistemology, Old and New". IN: Braunstein, Jean-François; Schmidgen, Henning; Schöttler, Peter (org.). 2012. *Epistemology and History. From Bachelard and Canguilhem to Today's History of Science*. Preprint 434, Max-Planck-Institut für Wissenschaftsgeschichte, pp. 33-40.

Braunstein, Jean-François. 2016. "Entrevista com Jean-François Braunstein" IN: Almeida, Tiago Santos; Camolezi, Marcos. *Intelligere*, Revista de História Intelectual, São Paulo, v. 2, n. 1 [2], pp. 156-171.

Brenner, Anastasios. 2002. *Les Origines Françaises de la Philosophie des Sciences*. Paris: PUF.

Butterfield, Herbert. 1968 [1957]. *The Origins of Modern Science: 1300-1800*. 2th ed. London: Chapman & Hall.

Canguilhem, Georges. 1984 [1943]. *Le Normal et le Pathologique*. 5th ed. Paris: PUF.

Canguilhem, Georges. 2002 [1956]. "Qu´est-ce que la Psychologie?". IN: Canguilhem, Georges. 2002. *Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie.* 7th ed. Paris: Vrin, pp. 365-381.

Canguilhem, Georges. 2002 [1957]. "Fontenelle, Philosophe et Historien des Sciences". IN: Canguilhem, Georges. 2002. *Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie.* 7th ed. Paris: Vrin, pp. 51-58.

Canguilhem, Georges. 2002 [1958]. "La Philosophie Biologique d'Auguste Comte et son Influence en France au XIX^e siècle". IN: Canguilhem, Georges. 2002. *Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie.* 7th ed. Paris: Vrin, pp. 61-74.

Canguilhem, Georges. 2002 [1959]. "Pathologie et Physiologie de la Thyroïde au XIX^e siècle". IN: Canguilhem, Georges. 2002. *Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie.* 7th ed. Paris: Vrin, pp. 274-294.

Canguilhem, Georges. 2002 [1961]. "L'École de Montpellier Jugée par Auguste Comte". IN: Canguilhem, Georges. 2002. Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie. 7th ed. Paris: Vrin, pp. 75-80.

Canguilhem, Georges. 2002 [1964]. "Histoire des Eeligions et Histoire des Sciences dans la Théorie du Fétichisme chez A. Comte". IN: Canguilhem, Georges. 2002. Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie. 7th ed. Paris: Vrin, pp. 81-100.

Canguilhem, Georges. 2002 [1965]. "L´Idée de Médecine Expérimentale selon Claude Bernard". IN: Canguilhem, Georges. 2002. Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie. 7th ed. Paris: Vrin, pp. 127-142.

Canguilhem, Georges. 2002 [1966]. "L'Évolution du Concept de Méthode de Claude Bernard à Gaston Bachelard". IN: Canguilhem, Georges. 2002. Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie. 7th ed. Paris: Vrin, pp. 163-172.

Canguilhem, Georges. 2002 [1968]. "Théorie et Technique de l'Expérimentation chez Claude Bernard". IN: Canguilhem, Georges. 2002. Études d'Histoire et de Philosophie des Sciences Concernant les Vivants et la Vie. 7th ed. Paris: Vrin, pp. 143-155.

Canguilhem, Georges. 2009 [1951]. "L'Expérimentation en Biologie Animale". IN: Canguilhem, Georges. 2009. La Connaissance de la Vie. 2th ed. Paris: Vrin, pp. 17-39.

Canguilhem, Georges. 2015 [1957]. "Claude Bernard". IN: Canguilhem, Georges. 2015. Œuvres Complètes, vol. IV: Résistance, Philosophie Biologique et Histoire des Sciences (1940-1965). Paris: Vrin, pp. 757-764.

Canguilhem, Georges. 2018 [1967]. "Un Physiologiste Philosophe: Claude Bernard". IN: Canguilhem, Georges. 2018. Œuvres Complètes, vol. V: Histoire des Sciences, Épistémologie, Commémorations (1966-1995). Paris: Vrin, pp. 143-165.

Canguilhem, Georges. 2018 [1970]. "Bichat". IN: Canguilhem, Georges. 2018. Œuvres Complètes, vol. V: Histoire des Sciences, Épistémologie, Commémorations (1966-1995). Paris: Vrin, pp. 269-274.
Canguilhem, Georges. 2018 [1973] "Vie". IN: Canguilhem, Georges. 2018. Œuvres Complètes, vol. V: Histoire des Sciences, Épistémologie, Commémorations (1966-1995). Paris: Vrin, pp. 573-606.
Canguilhem, Georges. 2018 [1984]. "Entretien avec Georges Canguilhem". IN: Canguilhem, Georges. 2018. Œuvres Complètes, vol. V: Histoire des Sciences, Épistémologie, Commémorations (1966-1995). Paris: Vrin, pp. 999-1012.
Canguilhem, Georges; Lapassade, Georges; Piquemal, Jacques; Ulmann, Jacques. 2003 [1962]. Du Développement à l'Évolution au XIXe siècle. 3th ed. Paris: PUF.
Cohen, I. Bernard. 1985. Revolution in Science. Cambridge: The Belknap Press of Harvard University Press.
Cohen, I. Bernard. 1987. "Revolution, Evolution and Emergence in the Development of Modern Science". *History and Technology: An international journal* 4 (1-4): 183-211.
Crombie, Alistair Cameron. 1953. Robert Grosseteste and the Origins of Experimental Science, 1100-1700. Oxford: Clarendon Press.
Crombie, Alistair Cameron. 1994. Styles of Scientific Thinking in the European Tradition: The History of Argument and Explanation Especially in the Mathematical and Biomedical Sciences and Arts. 3 vols. London: Duckworth.
Davidson, Arnold. 2001. The Emergence of Sexuality: Historical Epistemology and the Formation of Concepts. Harvard: Harvard University Press.
Dreyfus, Dina (org.). 1993 [1965]. "Philosophie et Vérité". *Cahiers philosophique*. Paris: Centre national de documentation pédagogique, JUN, pp. 79-96.
Duhem, Pierre. 1896. "L´Évolution des Théories physiques du XVIIIe Siècle jusqu´à nos Jours". *Revue des questions scientifiques*, oct., 1896.
Duhem, Pierre. 1905. L'Évolution de la Mécanique. Paris: Hermann.
Fleck, Ludwik. 1986 [1946]. "Problems of the Science of Science". IN: Cohen, Robert; Schnelle, Thomas (eds.) Cognition and Fact: Materials on Ludwik Fleck. Boston: Reidel, pp. 113-128.
Gayon, Jean. 2003. "Bachelard et l'Histoire des Sciences". IN: Wunenburguer, Jean-Jacques (dir.). 2003. *Bachelard et l'Épistémologie Française*. Paris: PUF.
Granger, Gilles-Gaston. 1968. Essai d'une Philosophie du Style. Paris: Armand Colin.
Hall, Rupert. 1983 [1954]. The Scientific Revolution, 1500-1800: The Formation of the Modern Scientific Attitude. 2th ed. London: Longmas, Green and Co.
Hacking, Ian. 1975. The Emergence of Probability: A Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference. Cambridge: Cambridge University Press.
Hacking, Ian. 1981. Scientific Revolutions. London, New York: Oxford University Press.
Hacking, Ian. 1983. Representing and Intervening: Introductory Topics in the Philosophy of Natural Science. Cambridge: Cambridge University Press.
Hacking, Ian. 1987. "Was There a Probabilistic Revolution: 1800-1930?" IN: Krüger, Lorenz; Daston, Lorraine; Heidelberger, Michael (eds.) *The probabilistic revolution*, vol. 1: Ideas in history. Cambridge: MA, 45-55.
Hacking, Ian. 1992. "'Style' for Historians and Philosophers". *Studies in History and Philosophy of Science Part A*, 23 (1), pp. 1-20.
Hacking, Ian. 1994. "Styles of Scientific Thinking or Reasoning: A New Analytical Tool for Historians and Philosophers of the Sciences". IN: Gavroglu, K.; Christianidis, J.; Nicolaidis, E. (eds) *Trends in the Historiography of Science.* Boston Studies in the Philosophy of Science, vol 151. Springer: Dordrecht, 31-48.
Lecourt, Dominique. 1974. *Pour une Critique de l'Épistémologie: Bachelard, Canguilhem, Foucault*. Paris: Maspero.

Lecourt, Dominique. 1978 [1969]. *L'Épistémologie Historique de Gaston Bachelard.* 5th ed. Paris: Vrin.

Lecourt, Dominique. 2008. *Georges Canguilhem*. Paris: PUF.

Limoges, Camille. 2015. "Introduction: Philosophie Biologique, Histoire des Sciences et Interventions Philosophiques: Georges Canguilhem 1940-1965". IN: Canguilhem, Georges. 2015. Œuvres Complètes, vol. IV: Résistance, Philosophie Biologique et Histoire des Sciences (1940-1965). Paris: Vrin, pp. 7-48.

Macherey, Pierre. 1964. "A Filosofia da Ciência de Georges Canguilhem". IN: Canguilhem, Georges. 2012. O normal e o Patológico. Rio de Janeiro: Forense, p. 243-277.

Millikan, Robert. 1918. "Twentieth Century Physics". IN: *Annual Report of the Board of Regents of the Smithsonian Institution*. Washington D.C.: Government Printing Office, p. 169-184.

Paltrinieri, Luca. 2012. *L'Expérience du Concept: Michel Foucault entre Épistémologie et Histoire.* Paris: Publications de la Sorbonne.

Portocarrero, Vera. 2009. *As ciências da vida: de Canguilhem a Foucault*. Rio de Janeiro: Fiocruz.

Rheinberger, Hans-Jörg. 2010 [2007]. *On historicizing epistemology: an essay*. Translated by David Fernbach. Stanford: Stanford University Press.

Sciortino, Luca. 2017. "On Ian Hacking's Notion of Style of Reasoning". *Erkenntnis*, (82): 243–264.

Spitzer, Leo. 1970 [1948]. "Art du Langage et Linguistique" [1948] Translated by Michel Foucault. IN: Spitzer, Leo. 1970. *Études de Style*. Paris: Gallimard, 1970.

Toulmin, Stephen. 1972. Human Understanding: The collective Use and Evolution of Concepts. Oxford: Clarendon Press.