

Brunschvicg, Bergson, and Meyerson: influences and counter-influences on Bachelard's philosophy

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Introduction

A philosopher's thought does not constitute itself. It organizes itself around affiliations and controversies - or, in other words, it integrates a philosophical school, and confronts other schools. A philosopher takes a position in his circumstances from those relations of sympathy and opposition. In this way, Bachelard's relations of approximation or departure with main French philosophers of the beginning of 20th century helped him to establish his own place in French academy.

As a student of Léon Brunschvicg, Bachelard became involved, from the end of the 20s, in the debates of French intellectual world. This involvement occurred not only through the publication of almost always controversial articles, but also the participation in countless congresses and meetings attended by philosophers, writers and scientists - such as the Société Française de Philosophie, for example. Bachelard was thus a philosopher who participated intensively in the academic life of his generation.

According to Cristina Chimento (2001), Bachelard sought to build an image of an old style philosopher, far from the bureaucratic demands of the Academy; however, we cannot speak of Bachelard as a philosopher who moves away from the hustle of the city, a thinker who isolates himself like a Heraclitus. Although Bachelard dreamed of the Champagne fields, he was a philosopher at the modern university. Bachelard held a position against traditional philosophy, but he unmistakably stood within the philosophical tradition.

In this essay, we present Bachelard's relationship with his main interlocutors: Brunschvicg, Bergson and Meyerson. As will become clear, it is from these interlocutions that Bachelard positions himself as a philosopher. In a sense, the counter-influences received by

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Bachelard are as important in the constitution of his thinking as the direct influences he accepted.

Was Bachelard a self-taught man?

Bachelard had his philosophical and scientific training carried out, to a large extent, in a self-taught way. As Dominique Lecourt says,

when he passed, belatedly, to the agrégation em 1922, he was teaching physics and chemistry at the college of Bar-sur-Aube. These details of individual history, which could be anecdotal, have the interest of revealing at the same time Bachelard's relative freedom in relation to the dominant philosophical tradition (LECOURT, 1974, p.19-20)².

Olival Freire agrees with Lecourt's position. Freire (1995) recalls that Bachelard studied the theory of relativity and quantum theory (and wrote about these fields of study) at a time when these fields were practically ignored in French university education - despite the important exception of *La déduction relativiste* (MEYERSON, 1925). Furthermore, according to Freire, Bachelard's conception of the location of matter in space-time, formulated in *Le nouvel esprit scientifique* (BACHELARD, 1946),

anticipate, in our opinion, essential aspects of quantum theory (non-quantum locality) already contained in the formalism of quantum theory, but which only emerged in the debates between Einstein and Bohr, in 1935, and were effectively clarified in the debates, and experimental tests, around a theoretical result only formulated in 1964, the so-called Bell Inequalities; therefore, they were clarified subsequently to the disappearance of Bachelard (FREIRE, 1995, p.43-44).

Bachelard's pioneering and self-teaching does not mean, however, a complete philosophical independence. Bachelard was deeply influenced by other philosophers of his day.

We will point out three fundamental thinkers, each representing the motivation for an

² lorsqu'il passa, tardivement, l'agrégation em 1922, il enseignait la physique et la chimie au collège de Bar-sur-Aube. Ces détails d'histoire individuelle, qui pourraient être anecdotiques, ont l'intérêt de faire apparaître tout à la fois la relative liberté de Bachelard par rapport à la tradition philosophique dominante.

aspect of his philosophy. The first of these three philosophers that will be presented, Léon Brunschvicg (1869-1944), exerted a lasting influence on the bachelardian thought. The other two - Henri Bergson (1859-1941) and Émile Meyerson (1859-1933) - are examples of a philosophical position of *no*: they are influences that led Bachelard to formulate a perspective of negation, opposition, and, therefore, of construction and dialectical overcoming.

The influence of Brunschvicg

The greatest influence received by Bachelard is undoubtedly the one of Léon Brunschvicg, who, together with Abel Rey, supervised Bachelard's doctorate. As Jean Wahl says, “[w]e can consider him first of all as the one who has continued, renewing it on many points, the teaching of Léon Brunschvicg”³ (WAHL, 1962, p.164). Teresa Castelão also states that, instead of following a Bergsonian “positive metaphysics”, Bachelard followed Brunschvicg, in defending the importance of mathematics as the language par excellence of the “new scientific spirit” (CASTELÃO-LAWLESS, 1997). Michel Vadée notes that Bachelard explicitly recognizes his proximity to Brunschvicg, especially regarding the proposal for a “reconstruction of criticism” – a reconstruction that reorganizes the distinction between idealism and realism on new bases (VADÉE, 1975).

Gary Gutting agrees that Bachelard's basic conception of science and philosophy

derives most directly from Brunschvicg. [...] Like Brunschvicg, Bachelard sees philosophy as having to work out an understanding of reason by reflection on the historical development of science; and, again like Brunschvicg, his work is based on case-studies in the history of mathematics and the physical sciences (GUTTING, 2001, p.85-86).

This means that, for Gutting, Brunschvicg's influence on Bachelard is not limited to the object of study, but also operates on the research method itself, which is scientific progress' case studies.

For Cristina Chimisso, the crucial aspect of Brunschvicg's influence on Bachelard is the conception of the dynamics and plasticity of reason. Chimisso states that Bachelard wondered

³ “[n]ous pouvons le considérer en premier lieu comme celui qui a continué, en le renouvelant sur bien des points, l’enseignement de Léon Brunschvicg”

how it was possible that philosophers could still talk about fixed frameworks of intelligence and reason, after Brunshvich's works on progress and transformation of the mind (CHIMISSO, 2008). Indeed, Bachelard accompanies Brunshvich in considering that reason and its object are mutually transformed.

Émile Bréhier describes Brunshvich's philosophy as a reaction against the tendency to approach thought, and its history, from an external perspective - a trend in which Durkheim, for example, participates. For Bréhier, Brunshvich "brings intelligence into the effective life of the mind; human understanding is not defined by a set of fixed categories"⁴ (BRÉHIER, 1950, p.52).

In 1945, the year after Brunshvich's death, Bachelard published, in the *Revue de Métaphysique et de morale* (BACHELARD, 1972a), a short text in which he states that "[t]o read Brunshvich, to hear the master, is to participate in the spirit of finesse, it is to go immediately to the sensitive point of the metaphysical problems, it is to recognize the psychological effectiveness of the philosophical reflection"⁵ (BACHELARD, 1972a, p.169). In this philosophical reflection, according to Bachelard, "[b]y the decisive action of such subtle modifications, he felt well that the doctrine of an absolute a priori, immutable, stable, without flexibility, did not correspond any more to the scientific information. And Brunshvich had thus abandoned a whole part of the Kantian doctrines"⁶ (BACHELARD, 1972a, p.172).

It is unquestionable that the conception of a reason that is transformed dialectically, a reason devoid of an absolute *a priori*, is one of the principles of Brunshvich's philosophy inherited by the bachelardian thought. That is why Bachelard, in his article, affirms, in a tone of frank approval, that Brunshvich proposes a dialectic between "the measure and the measured", "the numerant and the numbered", "the determinant and the determined", "the instrument and the instrumented" (BACHELARD, 1972a) – that is: the elements of the poles of knowledge become mutually dependent; they become complementary and mutually constitutive and are in constant oscillating motion.

⁴ "fait rentrer l'intelligence dans la vie effective de l'esprit; l'entendement humain n'est pas défini par un ensemble de catégories fixes".

⁵ "[I]ire Brunshvich, entendre le maître, c'est participer à l'esprit de finesse, c'est aller tout de suite au point sensible des problèmes métaphysiques, c'est reconnaître l'efficacité psychologique de la réflexion philosophique".

⁶ "[p]ar l'action décisive de modifications si subtiles, il sentait bien que la doctrine d'un a priori absolu, immuable, stable, sans souplesse, ne correspondait plus à l'information scientifique. Et Brunshvich avait ainsi abandonné toute une partie des doctrines kantienne".

In this sense, Marcel Deschoux states that, for Brunschvicg, thought “is perpetual invention”⁷ (DESCHOUX, 1949): according to Deschoux, Brunschvicg's philosophy is a “philosophie de la raison, mais d’une raison vivante, et créatrice de ces propres normes par la fécondation incessante de son rapport essentiel à l’expérience”⁸ (DESCHOUX, 1949, p.41). Brunschvicg’s philosophy is essentially a philosophy of scientific progress - just like Bachelard's philosophy of science.

Brunschvicg takes a more specific position on the issue of scientific progress in a booklet: *La physique du vingtième siècle et la philosophie* (BRUNSCHVICG, 1936), which is a development of a conference held on February 10, 1936 at the *Fondation hellénique de la cité universitaire de Paris*. This text, one of the last published by Brunschvicg⁹, is particularly interesting because it deals with the fundamental question from which the Bachelard's original reflections originate: the question of contemporary science.

In this text, Brunschvicg states that the methods of science differ from those of the knowledge of ordinary life, since the problems addressed in one case and in the other are different (BRUNSCHVICG, 1936). For Brunschvicg, the “nature” that “children and children peoples” (BRUNSCHVICG, 1936) have as reality is not, in fact, the reality that one has in adulthood. In order to receive this adult reality, it is not enough to enrich the details of the perception of the sensitive real: it is necessary to make, instead, a “heroic effort of conversion”¹⁰ (BRUNSCHVICG, 1936). In the same way, it is easy to approach science by pointing out the similarities between the scientific conceptions about the macrouniverse and the microuniverse; but this gesture of pointing them out does not correspond effectively to the practice of scientists.

According to Brunschvicg, until the end of the 19th century it would be possible for the philosopher to bring the world of ordinary life closer to the world of science; Kant's theory of knowledge presented an adequate solution for both epistemological instances. Yet,

⁷ “est invention perpétuelle”.

⁸ “philosophie de la raison, mais d’une raison vivante, et créatrice de ces propres normes par la fécondation incessante de son rapport essentiel à l’expérience”.

⁹ According to the list of all Brunschvicg's published work made available by Marcel Deschoux (1949), from 1932-1934 the philosopher's production decreased significantly; the last texts published in life by Brunschvicg are from 1938. Yvon Belaval recalls that, with the fall of France before Germany in World War II, Brunschvicg, persecuted by Nazism, abandoned Paris and lived his last years in hiding, until he died in 1944 (BELAVAL, 2007, p.371-373).

¹⁰ “effort héroïque de conversion”.

at the end of the XIXth century, the philosophy of physics was suffering from what could be called a crisis of ease, which had led to a general state of 'half-skepticism' with respect to the methods and truths which the previous generations had asked to support the foundation of our civilization. The bankruptcy of science, commonplace of the ignorant, seemed to be admitted and ratified by the most authorized of the scientists¹¹ (BRUNSCHVICG, 1936, p.14).

For Brunschvicg, at the end of the 19th century there were experiences and notions that no longer correspond to the kind of epistemology in which science and common knowledge follow the same principles; it is discovered, with surprise, that both philosophy (via Nietzsche) and science (through discoveries that contradicted the mechanistic paradigm¹²) contain scandalous irrationality. As a result, a crisis is established between science and philosophy.

However, "the so-called crises, which would correspond to the marvelous progress of astronomy and microphysics, enlighten and instruct us more than they dazzle and amaze us"¹³ (BRUNSCHVICG, 1936, p.27). These alleged crises led us to reject not scientific reason, but *metaphysical reason*, which is believed to be a "pure reason". The "pure reason" is replaced by a "fine reason", in the face of a "fine experience", which refuses the immediate appearance, the "experience that is believed to be *pure*" (BRUNSCHVICG, 1936).

In short, Brunschvicg's thesis in *La physique du vingtième siècle et la philosophie* is that philosophy needs to abandon metaphysical speculation (on Kantian a priori, for example), and move towards understanding, via science, of necessary connection between reason and experience. It is necessary to understand the transformational capacity of reason: "Crisis of reality, the scholars will say; which for the philosopher means crisis of realism, crisis of imagination, which is basically an imaginary crisis"¹⁴ (BRUNSCHVICG, 1936, p.25).

¹¹ à la fin du XIXe siècle, la philosophie de la physique souffrait de ce que l'on pourrait appeler une crise de facilité, qui avait amené un état général de 'demi-scepticisme' vis-à-vis des méthodes et des vérités auxquelles les générations précédentes avaient demandé de soutenir l'assise de notre civilisation. La faillite de la science, lieu commun des ignorants, semblait avouée et ratifiée par les plus autorisés des savants

¹² The obvious reference here is KUHN (2000). We are use the term *paradigm* without qualms because an essential part of Kuhn's thesis in his classic work corresponds, albeit with other terminology, to ideas that can be found in Bachelard. A very close correlation can be made, for example, between Kuhn's *revolutionary science* and Bachelard's *epistemological rupture*.

¹³ "les prétendues crises, qui correspondraient aux merveilleux progrès de l'astronomie et de la microphysique, nous éclairent et nous instruisent plus qu'elles ne nous éblouissent et ne nous étonnent".

¹⁴ "*Crise de réalité*, diront les savants; ce qui pour le philosophe signifie *crise de réalisme*, crise d'imagination, qui est au fond une crise imaginaire".

It is evident that Brunshvich's influence on Bachelard was decisive for the constitution of his epistemology. However, there are some differences between them. We will follow Marly Bulcão's position. According to Bulcão, Brunshvich, in defending the transformation of rationality, does not propose a complete transformation of reason, but only a transformation in the modes of reasoning; the foundation of reason, the cause of all the transformation of rationality, is found on the plane of morality. For Brunshvich, reason changes while acquiring a higher moral conscience; it "moves only within the scope of ideas" so that it can develop moral conscience (BULCÃO, 1994, p.119).

Bulcão argues, therefore, that the reason Brunshvich speaks of is a contemplative reason, a mathematician's reason, and not a reason that involves the whole cognitive capacity of man, as proposed by Bachelard.

Bulcão states that, contrary to Brunshvich's conception,

bachelardian reason is fundamentally work, because it is not a simple spirit turned to passive contemplation of the spectacle of the world. To affirm, like Bachelard, that the progress of knowledge implies construction, rectification, and reorganization, is to recognize the effectiveness of active reason, is to rebel against idle reason that passively falls asleep in tradition (BULCÃO, 1994, p.117).

In this sense, Brunshvich's rationalism is not an *applied rationalism*, nor a *rational materialism*, as is Bachelard's - in this sense, quite original - rationalism. It is a pure rationalism, a rationalism whose model is essentially mathematical. This makes Brunshvich, ultimately, a Platonic. Indeed, we can also discover a Bachelard who, expressly, calls himself a Platonic realist, especially in *Essai sur la connaissance approchée* (BACHELARD, 1968) and in *La valeur inductive de la relativité* (BACHELARD, 2014), which are two of his first works, and still under the strong influence of Brunshvich.

The (counter-)influence of Bergson

Another influence in Bachelard thought is, in a different sense, that of the philosophers against whom Bachelard argues. These philosophers can be classified into two types: the first type is that of philosophers who hold a philosophy which is adversary to science, or whose

conception of science has a negative value; the second is that of philosophers who understand the value of science, but intend to subject it to philosophical ties.

Bachelard thus speaks of that first group of philosophers:

Since the beginning of our century, it is very common to meet philosophers who seem to have taken on the task of giving science a bad conscience. They tirelessly repeat the story of the sorcerer who sets in motion the hidden forces without ever having the power to return them to their roots when the unleashed forces become pernicious. The only fact that one judges with a poor image - with such a false image - of the responsibilities of science, proves that one does not realize, in all its novelty, the situation of *the man before science*¹⁵ (BACHELARD, 1952, p.11).

For Bachelard, Bergson is an example of a philosopher who devalues science. In *La évolution créatrice*, Bergson states that science, be it ancient or modern, necessarily uses a “cinematographic method”: “[m]odern science, like ancient science, proceeds according to the cinematographic method. It cannot do otherwise; all science is subject to this law”¹⁶ (BERGSON, 1959, p.192). What is this method? It is an analysis procedure in which the moving reality is masked by the illusion of permanence. Every analysis, in turn, consists of expressing one thing in terms of another. As Bergson says in the conference *Introduction à la métaphysique*,

[t]o analyze is thus to express a thing in terms of what is not it. All analysis is thus a translation, a development in symbols, a representation taken from successive points of view from which we note as many contacts between the new object, which we are studying, and others, which we believe we already know. [...] This being said, it is easy to see that the usual function of positive science is to analyze. It therefore works above all on symbols¹⁷ (BERGSON, 1969, p.100).

¹⁵ Depuis le début de notre siècle, il est fort commun de rencontrer des philosophes qui semblent avoir pris pour tâche de donner à la science une mauvaise conscience. D’une manière inlassable on répète l’anecdote du sorcier qui met em branle les forces cachées sans plus jamais avoir le pouvoir de les remettre au repôs quand les forces déchaînées deviennent pernicieuses. Le seul fait qu’on juge avec une pauvre image – avec une si fausse image – des responsabilités de la science, prouve qu’on ne réalise pas, dans toute sa nouveauté, la situation de *l’homme devant la science*.

¹⁶ “[l]a science moderne, comme la science antique, procède selon la méthode cinématographique. Elle ne peut faire autrement; toute science est assujettie à cette loi”.

¹⁷ [a]nalyser consiste donc à exprimer une chose en fonction de ce qui n'est pas elle. Toute analyse est ainsi une traduction, un développement en symboles, une représentation prise de points de vue successifs d'où l'on note autant de contacts entre l'objet nouveau, qu'on étudie, et d'autres, que l'on croit déjà connaître. [...] Ceci posé, on verrait sans peine que la science positive a pour fonction habituelle d'analyser. Elle travaille donc avant tout sur des symboles.

This means that science, for Bergson, replaces reality with signs that can be manipulated, signs that have merely the role "to note in a fixed form a fixed aspect of reality"¹⁸ (BERGSON, 1959, p.192), and which, furthermore, do not reveal the *continuous* nature of time. Thus, following the cinematographic method of science, a snapshot of the film is taken to analyze the entire film, which means doing a one-off experiment to understand the whole reality that presents itself to consciousness as flow. In short: all natural science, for Bergson, is a reductionist conception of the lived reality - it does not matter if we talk about ancient or modern science, for they don't differ in quality, but only differ in degree: "It is the same cinematographic mechanism in both cases, but it reaches, in the second, a precision that it cannot have in the first"¹⁹ (BERGSON, 1959, p.193-194).

In other words, science cannot approach the time of the reality, which is a continuous time, a time in which the interpenetrations of durations cannot be reduced to a simple instantaneous juxtaposition in space (BERGSON, 1959). According to Bergson, time, in science, is exactly an *instantaneous juxtaposition in space*: it has no duration²⁰. For Bergson, therefore, modern physics loses sight of the reality of time:

Time is either invention or it is nothing at all. But physics cannot take time-invention into account, being bound to the cinematographic method. It limits itself to counting the simultaneities between the constituent events of this time and the positions of the mobile T on its trajectory. It detaches these events from the whole which takes on a new form at each moment and which communicates to them something of its novelty. It considers them in an abstract state, such as they would be outside the living whole, that is to say in a time unfolded in space. It retains only those events or systems of events that can be isolated in this way without making them undergo too deep a deformation, because only these lend themselves to the application of its method. Our physics dates from the day when we were able to isolate such systems. In short, if modern physics differs from the old one in that it considers any moment of time, it rests entirely on a substitution of time-length for time-invention²¹ (BERGSON, 1959, p.199).

¹⁸ "de noter sous une forme arrêtée un aspect fixe de la réalité".

¹⁹ "C'est le même mécanisme cinématographique dans les deux cas, mais il atteint, dans le second, une précision qu'il ne peut pas avoir dans le premier".

²⁰ Bachelard disagrees with Bergson's views on time. If, for Bergson, time is continuous, time is duration, for Bachelard it is instant, and it can only be apprehended as such. See Bachelard's *L'intuition de l'instant* (BACHELARD, 1966) and *La dialectique de la durée* (BACHELARD, 1936).

²¹ Le temps est invention ou il n'est rien du tout. Mais du temps-invention la physique ne peut pas tenir compte, astreinte qu'elle est à la méthode cinématographique. Elle se borne à compter les simultanités entre les événements constitutifs de ce temps et les positions du mobile T sur sa trajectoire. Elle détache ces événements du tout qui revêt à chaque instant une nouvelle forme et qui leur communique quelque chose de sa nouveauté. Elle les considère à l'état abstrait, tels qu'ils

Scientific perspective constitutes, for Bergson, a “metaphysics”²² that does not correspond to our intuition; it is “a certain new scholasticism that grew during the second half of the nineteenth century around the physics of Galileo”²³ (BERGSON, 1959, p.214).

Bachelard rejects this type of criticism of modern science (BACHELARD, 1952). According to Bachelard, “[i]n the judgment of most philosophers of our time, rationalism is a poor philosophy”²⁴ (BACHELARD, 1972b, p.90); by *rationalism*, Bachelard understands the philosophy of the sciences that seeks to understand the practice of science itself from an internalist point of view. Bachelard, in effect, criticizes the externalism practiced “by most philosophers”:

One never puts oneself, in order to judge it, in the flow of the consciousness of science; never, on the philosophical side, one adheres to the very movement of the actual effective progress of the scientific research. It is not astonishing that an external polemic on the value of science is entirely foreign to the seizure of the values of thought that rationalism represents in act²⁵ (BACHELARD, 1972b, p.90).

Bachelard affirms, with some irony, that, for these philosophers, it is enough to place an adjective so that all scientific knowledge is despised, because what they detract from is not science, but a caricature of it: “[i]t is against this caricature of rationalism that philosophical criticism is most commonly exercised. Sometimes an adjective is enough. Bergson thus fights a ‘dry rationalism’. It is common to speak about a frozen rationalism, sclerotic, blind to the

seraient en dehors du tout vivant, c'est-à-dire dans un temps déroulé en espace. Elle ne retient que les événements ou systèmes d'événements qu'on peut isoler ainsi sans leur faire subir une déformation trop profonde, parce que ceux-là seuls se prêtent à l'application de sa méthode. Notre physique date du jour où l'on a su isoler de semblables systèmes. En résumé, si la physique moderne se distingue de l'ancienne en ce qu'elle considère n'importe quel moment du temps, elle repose tout entière sur une substitution du temps-longueur au temps-invention.

²² The term “metaphysics” has absolutely no negative connotation in Bergson's thinking; we believe that the use of this term to refer to science, in the context of its criticism, is an irony in relation to positivist claims.

²³ “une certaine scolastique nouvelle qui a poussé pendant la seconde moitié du XIXe siècle autour de la physique de Galilée”.

²⁴ “[a]u jugement de la plupart des philosophes de notre temps, le rationalisme est une philosophie pauvre”.

²⁵ Jamais l'on ne se met, pour en juger, dans le flux de la conscience de la science; jamais, du côté philosophique, on n'adhère au mouvement même du progrès effectif actuel de la recherche scientifique. Il n'est pas étonnant qu'une polémique externe sur la valeur de la science soit entièrement étrangère à la saisie des valeurs de pensée que représente le rationalisme en acte.

concrete experience"²⁶ (BACHELARD, 1972b, p.90).

For Bachelard, philosophers like Bergson - who invent and fight scarecrows of scientific rationality - cannot understand science, as they do not seek to follow it from within. They do not realize that, by bringing scientific rationality and common sense together, they produce an *idea of science* - but an idea that only has validity within the restricted world of their philosophical theories. This, in short, is the position of the philosophers of that first type: the philosophers who, due to a misunderstanding of what scientific work is, completely misjudge it.

The (counter-)influence of Meyerson

The second type of philosophers who influence Bachelard as *opponents* is that of thinkers who value science, but do not understand it from the criteria and categories of science itself. These philosophers, for Bachelard, do not seek to follow scientific practice; instead, they seek to use science as an example of applying their own philosophies. Their project is to establish the unity and eternity of reason and, therefore, to find in the categories of thought the guarantee of scientific knowledge - which means to establish continuity between the world of common sense and that of science²⁷. In other words, these philosophers establish *a priori* criteria according to which science must necessarily work; these criteria are conceived as absolute and valid in all instances of knowledge. Thus, Bachelard's opponent philosophers of this second type presuppose (1) the immutability of reason; and (2) the continuity between common and scientific knowledge.

An example of this type of philosopher is Émile Meyerson. According to Lecourt, who echoes the bachelardian judgment, Meyerson

does not neglect any of the most recent discoveries, examines non-Euclidean geometries as well as relativistic theories and quantum mechanics. Meyerson writes volume after volume, echoing the most important scientific events. But it is always to support the same thesis: that the human mind proceeds on all

²⁶ “[c]’est contre cette caricature du rationalisme que s’exerce le plus communément la critique philosophique. Un adjectif parfois y suffit. Bergson combat ainsi un ‘rationalisme sec’. Il est commun de parler d’un rationalisme figé, sclérosé, aveugle à l’expérience concrète”.

²⁷ For Lecourt, these elements are present in the classical philosophy as a whole (“à l’exception de celle de Spinoza”). (LECOURT, 2002, p.38).

occasions according to rules which are consubstantial to it and whose main - if not the only - one is to "reduce the diverse to the identical". Meyerson is determined to compete with positivism on the ground where it had seemed for a moment to be triumphant in order to establish the reign of spiritualism. [...] One understands why Meyerson could be Bachelard's privileged adversary. The continuous polemic that he leads, book after book, against this philosopher may surprise a reader of today where, in France at least, Meyerson's theses are hardly known anymore. But it should be remembered that Meyerson was the spiritualist who tried to enlist the contemporary physical sciences in the service of a doctrine which, in other respects, showed only indifference to them²⁸ (LECOURT, 1974, p.21-22).

For Bachelard, Meyerson's philosophy

is based on the unquestioned myth of the continuity of animal experience and common human experience, a continuity that extends into a continuity of vulgar and scientific experience. [...] One will see a page where a well-trained dog is given as knowing the rudiments of mechanics by the mere fact that it receives 'intelligently' in its mouth the piece of meat thrown by its master. For Meyerson, there is thus a certain notion of 'trajectory' in the animal²⁹ (BACHELARD, 1952, p.14-15).

Meyerson's *opus magna* is *Identité et réalité* (1908). In this work, he proposes to demonstrate: (1) that science must not be satisfied in enunciating laws of nature, but must explain the phenomena, and this explanation - which goes to the *reality underlying the phenomena themselves*, being, therefore, *ontological* - consists of the identification of the antecedent and the consequent; (2) that atomic theories are derived from the principle of

²⁸ ne néglige aucune des découvertes les plus récentes, examine aussi bien les géométries non euclidiennes que les théories relativistes et la mécanique quantique. Meyerson écrit volume sur volume, faisant écho aux événements scientifiques les plus importants. Mais c'est pour y soutenir toujours la même thèse: que l'esprit humain procède en toute occasion selon des règles qui lui sont consubstantiales et dont la principale - sinon l'unique - est de 'réduire le divers à l'identique". Meyerson s'acharne à disputer au positivisme le terrain où il avait pu sembler un instant triomphant pour y asseoir le règne du spiritualisme. [...] On comprend pourquoi Meyerson a pu être l'adversaire privilégié de Bachelard. La polémique continue qu'il mène, livre après livre, contre ce philosophe peut surprendre un lecteur d'à présent où, en France du moins, les thèses de Meyerson ne sont plus guère connues. Mais il faut se souvenir que Meyerson a été le spiritualiste qui a tenté d'enrôler les sciences physiques contemporaines au service d'une doctrine qui, par ailleurs, ne leur manifestait qu'indifférence.

²⁹ repose sur le mythe indiscuté de la continuité de l'expérience animale et de l'expérience humaine commune, continuité qui se prolongue en une continuité de l'expérience vulgaire et de l'expérience scientifique. [...] On y verra une page où un chien bien dressé est donné comme sachant les rudiments de la mécanique du seul fait qu'il reçoit 'intelligemment' dans sa gueule le morceau de viande lancé par son maître. Pour Meyerson, il y a ainsi chez l'animal une certaine notion de la 'trajectoire'.

causality, which is opposed to the irrational; (3) that the principle of causality gives rise to the principle of conservation; (4) that the principle of causality leads to the elimination of the time factor in science; (5) that even non-mechanical theories derive from the principle of causality; (6) that, therefore, all science - as well as all human knowledge - aims to explain the multiplicity of singular facts through a unitary system in which the totality of reality is given under the sign of identity. Meyerson's position is therefore critical of positivism, according to which scientific activity should not seek the true causes of phenomena, but only their laws. Contrary to positivism, which seeks to eliminate ontology from the world of science (through the conception that the objective of science should not be to discover the *causes of phenomena*, but only the *laws of an invariant relationship between phenomena*), Meyerson considers that science is, properly speaking, ontology.

According to Meyerson, it is possible to find the principles of science in the very reason (which is one, and always the same): "[t]hese conclusions are not a result of science, they derive from the aprioristic elements that it contains [...]. We then establish that the world of common sense is created by a process strictly analogous to that which produces scientific theories"³⁰ (MEYERSON, 1908, p.XVIII). The reason, but not science, is *a priori*: the physical sciences, in turn, change themselves all the time, because scientific laws are nothing more than more or less adequate approximations:

Regarding to the directly observed phenomenon, the law is never more or less approximated; with the help of successive corrections, we try to adapt the whole more and more closely to the true course of nature. But it is necessary to observe that these new contributions modify unceasingly the existing science³¹ (MEYERSON, 1908, p.22).

For Meyerson, it is necessary to discover scientific laws, but it is essential, first of all, to be able to find their *causes*. But what is a cause? Meyerson replies that "[when] we talk about

³⁰ "[c]es conclusions ne sont pas un résultat de la science, elles dérivent des éléments aprioriques que celle-ci recèle [...]. Nous établissons alors que le monde du sens commun est créé par un procédé strictement analogue à celui qui produit les théories scientifiques".

³¹ A l'égard du phénomène directement observé, la loi n'est jamais que le plus ou moins approchée; à l'aide de corrections successives, nous tâchons d'en adapter progressivement l'ensemble de plus en plus étroitement à la véritable marche de la nature. Mais il faut observer que ces nouveaux apports modifient sans cesse la science existente.

explaining a phenomenon, researching the causes, we seek to know its causes, we seek to know its pre-existence in time [...], or the rule of thumb that determines its transformation in time”³² (MEYERSON, 1908, p.35).

On the relationship between common sense and scientific knowledge, Meyerson states that

[w]e believe to the letter, as M. Le Roy himself once formulated it, that science corresponds to the same attitude as common sense. When this philosopher tells us that the scientist makes scientific facts and not brute facts, we also agree, since the scientific fact appears to us as referring to an object that the scientist has created. But [...] he has followed exactly the same procedure that the common sense has used to create the brute fact³³ (MEYERSON, 1908, p.433).

In other words: for Meyerson, all sciences are driven by the search for the causal explanation of reality; that search takes place according to the same principles of common sense; and the goal of that explanation is, in turn, to identify the unity and identity of the phenomena.

In *De l'explication dans les sciences* (1921), Meyerson takes up the themes presented in *Identité et réalité*, proposing to demonstrate that the scientific ontology, which consists in the search for the causal explanation of the phenomena, corresponds to the "deduction of the phenomenon starting from its antecedents, of which it should constitute the logical consequence"³⁴ (MEYERSON, 1921, p.VII [Tome I]). In the same volume, Meyerson also states that "human reason, while being antinomic by essence, is nevertheless one, the same in all fields and in all times"³⁵ (MEYERSON, 1921, p.VIII [Tome I]). These notions are applied by Meyerson to the study of the Theory of Relativity in *La déduction relativiste* (1925).

The greatest convergence between Meyerson and Bachelard's positions on science lies in the proposition that science is properly ontology. Both repudiate positivism, whose simplest

³² “Quand nous parlons d’expliquer un phénomène, d’em scruter les causes, nous cherchons à connaître soit as préexistence dans le temps [...] soit la règle empirique qui determine son changement dans le temps”.

³³ [n]ous croyons à la lettre, comme M. Le Roy lui-même l'avait autrefois formulé, que la science coorespond à la même attitude que le sens commun. Quand ce philosophe nous dit que le savant *fait* les faits scientifiques et non pas les faits bruts, nous sommes également d'accord, puisque le fait scientifique nous apparaît comme se rapportant à un objet que le savant a crée. Mais [...] il a suivi exactement le même procédé que le sens commun a employé pour créer le fait brut.

³⁴ “déduction du phénomène en partant de ses antécédents, dont il devra constituer la conséquence logique”.

³⁵ “la raison humaine, tout en étant antinomique par essence, est cependant une, la même dans tous les domaines e à toutes les époques”.

formulation corresponds to the search for the description of the laws corresponding to the phenomena, with the rejection of any explanation of *ultimate causes* – because the positivists holds that any *explanation of causes* is only metaphysics – for these laws.

However, the claim that science is ontology leads, in Meyerson and Bachelard, to quite different theses. For Meyerson, science is ontological because it *explains the real causal relations* between the antecedent and the consequent: "all its explanations are naturally, unconsciously, necessarily ontological"³⁶ (MEYERSON, 1921, p.181 [Tome II]); for Bachelard, science is ontological because it *creates objects*.

There are other differences between Meyerson's and Bachelard's thinking. On the one hand, Meyerson bases his philosophy of science on theory of knowledge (MEYERSON, 1921 [Tome I]); on the other, Bachelard rejects the need to base his philosophy on such a theory. For Meyerson, reason is one and immutable: "science and philosophy [...] are, both, emanations of reason and of a reason which remains fundamentally the same in these two manifestations. And as for the common sense, [...] it forms [...] only a stage on the same way"³⁷ (MEYERSON, 1921, p.361 [Tome II]); for Bachelard, on the contrary, reason is transformed and it unfolds in different rationalities. Meyerson states that the same reasonings are constituents of the field of common sense and the field of science, "for science part of common sense" (MEYERSON, 1921, p.183 [Tome II]); Bachelard rejects this thesis, proposing the existence of epistemological ruptures between these two fields. For Meyerson, science is deductive: the authority of scientific theories, their "explanatory force", has its origin in the procedure of deduction itself (MEYERSON, 1921 [Tome I]); for Bachelard, on the other hand, science is inductive³⁸. Meyerson has a deep realistic conviction: "we are [...] intimately convinced that nature, to the deepest of its manifestations, is

³⁶ "toutes ses explications sont naturellement, inconsciemment, nécessairement ontologiques".

³⁷ "science et philosophie [...] sont, l'une et l'autre, des émanations de la raison et d'une raison qui reste fondamentalement la même dans ces deux manifestations. Et quant au sens commun, [...] il ne forme [...] qu'une étape sur la même voie".

³⁸ Although by induction Bachelard understands something different from that proposed by tradition. Vadée says that "[p]our Bachelard, induction est synonyme de construction, voire même d'invention d'un 'réel scientifique' par la théorie" (VADÉE, 1975, p.72). In this sense, Marly Bulcão affirms that "Bachelard uses the term induction in a sense that is his own and that has not been approached by previous philosophies or sciences. The bachelardian sense is neither that of Aristotle - who defined it as a method of reasoning opposite to the syllogism [...] -, nor that of Bacon - that considered the enumeration as proper to the scientific inductive process -, nor that of Poincaré - that defined it as reasoning by recurrence. No meaning of induction can be equivalent to the bachelardian. Bachelard considers induction as a synonym for construction, that is, as the invention of a scientific real. Induction is the construction of new phenomena" (BULCÃO, 1994, p.101).

governed ineluctably by rigorous laws"³⁹ (MEYERSON, 1921, p.88 [Tome I]); Bachelard varies his conceptions, going from a natural realism to an anti-realism, and then to a second position realism, which is a scientific realism.

Conclusion

Bachelard was, to some extent, a philosophical heir to Brunschvicg; but the choice of his opponents - mainly Bergson and Meyerson - also defines the paths on which he built his philosophy of science.

Brunschvicg's influence on Bachelard's philosophy was huge: following in Brunschvicg's footsteps, Bachelard gave great importance to mathematics in the "new scientific spirit". In addition, like his professor, he sought to describe the development of scientific reason through case studies of scientific progress. This ended up showing him that human reason is plastic, it is changeable, it evolves; human thought is incessant invention. It is in this sense that there is, for both Brunschvicg and Bachelard, an epistemological break between common knowledge and scientific knowledge.

Bachelard's collision with Bergson's philosophy provided the possibility to clarify and define his own positions. Faced with the devaluation of science by Bergson, according to whom scientific knowledge is reductionist and replaces reality with manipulable signs, Bachelard reaffirms the need to follow science from within to correctly understand its processes.

Finally, Bachelard finds in Meyerson a philosopher who, unlike Bergson, judges science positively. However, Bachelard points out that Meyerson fails to follow science from within scientific work, but from an external philosophy; for Bachelard, Meyerson simply develops a philosophical system, with a theory of knowledge that assumes an immovable reason, and seeks to make science fit into it. Thus, Bachelard also rejects the Meyersonian theory of science: for Bachelard, Meyerson's great error was precisely to suppose a unitary and always identical reason.

The influence of one philosopher on another is not only through his adherence to those

³⁹ "nous sommes [...] intimement convaincus que la nature, jusqu'au plus profond de ses manifestations, est gouvernée inéluctablement par des lois rigoureuses".

ideas. The influence by opposition, the influence by difference, is just as important as that which occurs through convergence and intersection. In a way, Brunshvicg, Bergson and Meyerson were, all three, Bachelard's masters: that is exactly what Bachelard means by demanding an attitude of disagreeing with our masters. After all, "[i]n the work of science only one can love what one destroys, one can continue the past by denying it, one can venerate one's master by contradicting him. So yes, the School continues throughout a lifetime"⁴⁰ (BACHELARD, 1970, p.252).

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⁴⁰ "[d]ans l'oeuvre de la science seulement on peut aimer ce qu'on détruit, on peut continuer le passé en loe niant, on peut vénérer son maître en le contredisant. Alors oui, l'École continue tout le long d'une vie".

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