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A journey towards materialism: François Dagognet and the evolution of historical epistemology

Introduction

How can reason grasp the natural world? This has long been the central problem of epistemology. Reason and reality appear to be heterogeneous and the solutions to bridge their difference have been numerous. Philosophers in the tradition that we are now used to call ‘historical epistemology’¹ have had a particular approach to it: they have aimed to overcome the dichotomy between reason and reality, and in so doing to eliminate the question of the relationship between the two from philosophy. The distinctiveness of their approach includes the historicisation of both reason and nature, and the centrality of the sciences as the motor of change. It goes without saying that the question of what historical epistemology is, and which philosophers should be included under this label is far from settled. Some critics use this label normatively, and include philosophies according to their fundamental characteristics; others historically, and focus on intellectual traditions and milieus.² I shall not be concerned with these general problems here, but I shall indicate the philosophical ‘ingredients’ that in my view are at the core of historical epistemology, although these should not be seen as rigid characteristics. These ingredients are the normative part of my case for including Léon Brunschvicg at one end of the chronological span and François Dagognet at the other. From a historical point of view, the case for the inclusion of Brunschvicg and Dagognet is easily made.

My focus will be much narrower than a discussion of historical epistemology. I shall only discuss an aspect of the attempts to overcome the dichotomy between reason and reality undertaken in historical epistemology. I shall concentrate, for reasons of pertinence and space, only on three philosophers: Léon Brunschvicg, Gaston Bachelard and François

¹ For the introduction and use of the expression ‘historical epistemology’ see (Lecourt 1972); (Foucault 1996); (Gayon 1998); (Rheinberger 2005b).

² Critics writing in French are more inclined than those writing in English to have a normative rather than historical approach, and as a consequence include Thomas Kuhn and Paul Feyerabend, as for instance Anastasios Brenner has done (Brenner 2006), or Feyerabend and Imre Lakatos, as Denis Vernant has done ((Vernant 1990). Canguilhem called Kuhn’s philosophy ‘historical epistemology’ (Canguilhem 1994 [1968]). Jean-François Braunstein, on the other hand, isolates traits of a French style in history and philosophy of science (rather than a school), and argues that approaches such as Fleck’s, Crombie’s and Hacking’s share ‘un air de famille’ with the study of science in the French style (Braunstein 2008).

Dagognet. It is uncontroversial that Gaston Bachelard is the core representative of historical epistemology, along with Georges Canguilhem. I also place François Dagognet in this tradition. This is not particularly original: Dagognet discussed themes that had been previously examined by those philosophers, and regularly referred to them. Indeed, he wrote extensively about Georges Canguilhem's and Gaston Bachelard's philosophies.³ More to the point, he presented himself as the inheritor of this French tradition in philosophy of science, and in fact has been seen as Bachelard's and Canguilhem's heir.⁴ Brunschvicg, on the other hand, is nowadays often neglected, and this is unfortunate, because the roots of historical epistemology are to be found in his work. I do not mean that the history of historical epistemology started with Brunschvicg. To assign a beginning to a group of philosophies, or indeed to any philosophy, would be rather pointless. To paraphrase what Bachelard wrote about rationalism:⁵ a philosophy never begins, but it always continues. But we have to start somewhere, and Brunschvicg's work is a very meaningful starting point, both historically and normatively, as I shall briefly outline in the next section. Brunschvicg's philosophy exhibits the central ingredients of historical epistemology, including the question on which I shall focus in this paper: the attempt to overcome the traditional philosophical opposition of reason and reality, and of idealism and materialism. I shall not approach this issue as a static aspect of this tradition. Rather, I shall follow the history of the search for this solution as a development away from idealism and towards materialism. I shall start with Brunschvicg, and through Bachelard, arrive at Dagognet. Dagognet himself mentioned this evolution, as he argued that Bachelard continued Brunschvicg's task to overcome the dichotomy of reason and reality, and that in so doing, he embarked upon a journey that took him away from Brunschvicg's intellectualism.⁶

Léon Brunschvicg and the roots of historical epistemology

In Brunschvicg's work we find the combination of the various ingredients that are the core of historical epistemology. First, the most obvious ingredient: the close relationship between philosophy and science, but not science in general as we find in so much philosophy of science, but very much one particular science at the time. He mainly, though not exclusively, concentrated on mathematics. For him, mathematics is the only language in which nature answers our questions;⁷ therefore there can be no scientific knowledge without it. For this reason, mathematization of knowledge is one of the criteria that he used in order to judge the progress of human knowledge. When knowledge relies on mathematics, for him there are advancements, as in seventeenth-century cosmology; when mathematics is forgotten, we see a return to what he called common-sense realism, and an involution of knowledge, as for instance with Aristotle.⁸ The second, and again rather

³ (Dagognet 1965b, 1985b, 1997).

⁴ See for instance (Lecourt 2001, p. 113).

⁵ (Bachelard 1986 [1949], p. 54).

⁶ (Dagognet 1965a).

⁷ (Brunschvicg 1951, p. 7).

⁸ (Brunschvicg 1947, pp. 2-3, 47).

obvious, ingredient is the close relationship between philosophy and history of science. This is the core of his philosophy: he did not see science as static but rather as knowledge in evolution. His historical approach should not be confused with Comte's: for Brunschvicg the history of science is open-ended, and does not obey any particular law. Consequently, its future cannot be predicted.

Brunschvicg was not interested in the history of science for its own sake; he studied it in order to understand the mind.⁹ As he put it, history of science is to the philosopher what the laboratory is to the scientist.¹⁰ A better metaphor, however, would have been that of fossils that reveal the history of species, for he believed that the object that the philosopher studies, the mind, is changeable. And this brings us to the third element of Brunschvicg's philosophy that is also central to large part of historical epistemology. This is the aim of writing the history of the mind.¹¹ This enterprise makes sense only if one believes that the mind and its categories are not given once and for all. In his view, the changes that the mind undergoes could be observed in the history of science; non-Euclidean geometries and the theory of relativity were recent examples that testified to the mind's historicity. For Brunschvicg, these episodes were particularly important because they showed that even Kant, a philosopher to whom he was particularly close, had made the mistake to think that the history of science had concluded its course with Newton. He had therefore believed that Newtonian science could be the model of knowledge on which to base a theory of reason without history. However, the history of science continued, and showed that time and space could no longer be seen as unchangeable *a priori*. Philosophers should not make that mistake again, and think that future changes will not occur. On this point, Bachelard noted that Brunschvicg abandoned part of Kant's philosophy, and understood that the 'la doctrine d'un *a priori* absolu, immuable, stable, sans souplesse, ne correspondait plus à l'information scientifique'.¹² Science shows the way in which we should understand the mind and knowledge, and science has an open-ended history.

The fourth ingredient at the core of Brunschvicg's philosophy and historical epistemology is the focus of my article: this is the aim to overcome the separation of reason and reality. For Brunschvicg, science shows that reason and reality cannot be separated, and that neither of them is immutable: their interaction changes both. As Bachelard emphasised, for Brunschvicg the detail of scientific experience has a deep impact on scientific theory, and on its coherence. Conversely, theory is applied in the search for increased experimental subtlety. There is no clear demarcation between the two, just as there is no clear separation between reason and reality. This was in accordance with what Bachelard himself believed, namely that 'une doctrine de la science est désormais essentiellement... une doctrine de la transformation correlative de l'homme et des choses'.¹³ What Bachelard wrote about

⁹ Indeed, he wrote in a letter to George Sarton that he was not a historian of science, but rather a philosopher who studied la conscience (Brunschvicg 1923a).

¹⁰ (Brunschvicg 1923b, p. 162).

¹¹ I argued that a vast group of research programmes, carried out by philosophers, historians of science, general historians, psychologists and ethnologists in France in the first half of the twentieth century were all aimed at writing the history of the mind (Chimisso 2008b).

¹² (Bachelard 1972, p. 172).

¹³ (Bachelard 1951, p. 3).

Brunschvicg's philosophy is certainly correct – he did not present an overly Bachelardian Brunschvicg, as it were. And yet, we cannot help but think that the manner in which Brunschvicg overcame the dichotomy of reason and reality tilts the balance in favour of reason. The prevalent role played by reason in Brunschvicg's epistemology has its roots in mathematics. It can be argued that mathematics shaped his philosophy. It can be equally argued that he chose mathematics because it fit his philosophy, and both arguments can be valid at the same time. As he saw it, mathematics was the ideal science to understand how the mind works because in it 'l'intelligence s'émancipe de l'horizon borne des représentations sensibles'.¹⁴ For him, in mathematics the mind could be examined while working in a more autonomous way than in any other science. Incidentally, there is also an ethical and political inflection in Brunschvicg's use of mathematics, which derives from the Enlightenment's view of reason as instrument of justice: the purer the reason, the better the justice. Consistently with this view, Brunschvicg praised Condorcet's use of mathematics to overcome inequalities.¹⁵ But why is the independence of the mind required? If, as Brunschvicg believed, mind and reality change each other through their interaction, shouldn't we observe the interaction from both points of view? The problem is that Brunschvicg did not think that there were really two points of view, namely reason and reality. He did not believe that a mind-independent reality – the thing-in-itself, in Kantians terms – existed; and even if it did, he argued, we could not know it, so it would be of no interest to us.¹⁶ However, this means that the dialectic between reason and reality appears to be internal to the mind. Brunschvicg was aware of this, and in fact he never stopped presenting his own philosophy as a form of idealism¹⁷.

From Brunschvicg to Bachelard

Bachelard acknowledged that he followed the path opened by Brunschvicg, and, like the latter, he focused on overcoming the dichotomy of reason and reality. For all his acknowledgement of the teaching of his professor, however, differences between their respective approaches are apparent. The first, and most noticeable, difference between Brunschvicg and Bachelard is that for the latter mathematics was not the model of scientific reasoning. He mostly focused on physics and chemistry.¹⁸ The importance of the science of choice in historical epistemology is complex. I have mentioned that one of the element of historical epistemology is the centrality not of science in general but of one science in particular, in its historical development. However, Brunschvicg believed that mathematics was the model for the other sciences and for logic. His study of a specific science did not lead him to the conclusion that reason may work in different ways depending on the specific

¹⁴ (Brunschvicg 1912, p. x).

¹⁵ (Brunschvicg 1947, p. 116).

¹⁶ (Brunschvicg 1921: 47-48).

¹⁷ (Brunschvicg 1923b, p. 170).

¹⁸ For the importance of chemistry in French philosophy of science, including Bachelard, see (Bensaude-Vincent 2005); see also (Chimisso 2014) for the role of chemistry in Bachelard's philosophy.

science. By contrast, Bachelard took the specificity of the individual sciences very seriously, and proposed a liberal and open view of scientific rationality with his concept of regional rationalism.¹⁹ If rationality has different regions, then the study of each of them can contribute something distinctive. Bachelard's sciences of choice, physics and chemistry, provided him with a very different perspective from Brunschvicg's mathematics. The mind could not work independently at all in these sciences, or, to be more precise, in these sciences as Bachelard saw them. I would like to emphasise that like all philosophers, Bachelard constructed his objects – physics and chemistry – just as for him scientists construct scientific objects. This is important, also because an easy objection to what I am arguing is that, although Brunschvicg regarded mathematics as the best science to study from an epistemological point of view, physics was also important to him, as his work attests.²⁰ However, Émile Meyerson had a point when he suggested to Brunschvicg that mathematics dominated the latter's way of looking at science in general. Unsurprisingly, Brunschvicg rejected Meyerson's suggestion, and retorted that his own view of physics was different from Meyerson's.²¹ Brunschvicg's answer, however, was not very satisfactory. On the one hand, he claimed something that in my view is true: philosophers construct their objects differently, and Brunschvicg's and Meyerson's physics are indeed different. On the other hand, his answer did not directly address Meyerson's point; it can well be argued that Brunschvicg's physics is constructed on the model of mathematics. However, this is a large issue that I do not have the space to discuss here. The point is that there is a circular interaction in philosophy of science between the science studied and the epistemological representation of said science.

Much attention has been dedicated to how differently Brunschvicg and Bachelard on the one hand, and Meyerson on the other, regarded the sciences. Brunschvicg and Bachelard themselves emphasised their distance from Meyerson's philosophy on numerous occasions. But in fact, Brunschvicg and Bachelard constructed their objects, including physics and its history, in different ways. The revolution of the theory of relativity struck Bachelard as much as it did Brunschvicg, and arguably more, leading him to formulate one of his most distinctive concepts, that of *rupture épistémologique*. However, for Brunschvicg those revolutions were mainly theoretical, whereas for Bachelard they also brought about new objects and phenomena. As mentioned, Brunschvicg believed that it makes little sense to focus on a mind-independent reality; for him what we should focus on is what appears to us, namely phenomena. Bachelard also focused on phenomena, but for him phenomena are rather different from what Brunschvicg intended. Bachelard's 'phenomena' are not Kantian phenomena, what appears to us, but rather what science calls phenomena, new events that are created, controlled and manipulated in the laboratory. His view is best illustrated by his concept of *phénoménotechnique*, which he introduced in a general discussion about

¹⁹ (Bachelard 1986 [1949], Chapter 7).

²⁰ (Brunschvicg 1922).

²¹ (Brunschvicg and al. 1921, pp. 59-60).

scientific concepts,²² and refined it in his analysis of modern physics.²³ In *phénoménotechnique*, he wrote, no phenomenon appears naturally, no phenomenon is a given. In modern physics, '[l']ontologie [est] conditionnée par l'expérience technique'.²⁴ Indeed, for him '[u]n concept est devenu scientifique dans la proportion où il est devenu technique, où il est accompagné d'une technique de réalisation'.²⁵ The structure of nature itself has a human and technical character: Bachelard argued that 'le véritable ordre de la Nature, c'est l'ordre que nous mettons techniquement dans la Nature'.²⁶ Chemistry, in my view even more than physics, supports the material character of knowledge, and shows that separating reason and reality is impossible. Chemistry does not only change the way in which we think about matter, but also transforms matter, and creates new substances, which reason alone could never envisage. Bachelard wrote that chemistry's 'matérialisme technique n'est nullement un réalisme philosophique',²⁷ as the latter would still imply the separation of mind and object, and would not include the historical productivity of human actions. For Bachelard modern chemistry illustrates that scientific objects are both rationally and technically produced.

Bachelard introduced the technical production of material objects into historical epistemology, and in so doing he led the project of integrating reason and reality away from idealism. Dagognet was an attentive reader of Bachelard's original solution to the problem of the overcoming of the dichotomy between reason and reality, and emphasised that Bachelard never ceased 'de s'éloigner de l'intellectualisme de style brunshvicgien'.²⁸ It is noteworthy that he called Brunshvicg's philosophy intellectualism, as he aimed to stress what for him is the contemplative and analytical character of Brunshvicg's rationalism, as opposed to a rationalism of work and production.²⁹ For Dagognet, Bachelard took historical epistemology away from contemplation and analysis and towards facticity, production and work. Indeed, Dagognet read the development of Bachelard's own philosophy as a journey from an early idealism towards a rational materialism, a point that Pariente has subsequently developed in more detail.³⁰ Bachelard certainly brought the technical productivity of science into philosophy, but all the same his emphasis was often on the rational character of scientific objects. Bachelard's enterprise is still a history of the mind, even though the mind for him knows through technical applications, and operates by bringing new material objects into the world. For him, the activity of science is above all a rational activity; in the *Activité rationaliste de la physique contemporaine* Bachelard mentions his concept of *bibliomène*, which is not completely tongue-in-cheek. He claimed that the electron has a more solid existence than the moon, as it is mentioned in many more

²² (Bachelard 1993 [1938], p. 61).

²³ (Bachelard 1951); (Bachelard 1986 [1949]); (Bachelard 1991 [1934], p. 17); (Bachelard 1993 [1938], p. 61); on this topic, see also (Castelão-Lawless 1998); (Rheinberger 2005a); (Chimisso 2008a).

²⁴ (Bachelard, 1951, p. 82)

²⁵ (Bachelard, 1993[1938], p. 61)

²⁶ (Bachelard, 1991 [1934], p. 111).

²⁷ (Bachelard 1986 [1949], p. 8).

²⁸ (Dagognet 1984, p. 113).

²⁹ (Dagognet 1965a, p. 53)

³⁰ (Dagognet 1984, p. 113); (Pariente 2006).

books than the latter.³¹ Similarly, he emphasised that ‘la chimie a désormais la coherence des livres, la permanence des énormes bibliothèques!’.³² The journey of the integration of rational and real advanced from Brunschvicg to Bachelard, but it did not stop there.

Dagognet on the journey towards materialism

Dagognet noted that both Bachelard and Brunschvicg criticised Meyerson because for his separation of reason and reality. He commented, however, that Meyerson should not have been singled out for criticism, as the separation of réel et le rationnel est ‘l’éternel péché de la philosophie’.³³ Indeed, for him arguably the problem of the separation of rationality and reality is the main problem of philosophy. His aim to overcome this separation is very much in line with Brunschvicg’s and Bachelard’s philosophies. Bachelard had pursued that objective by pulling away from Brunschvicg’s idealism, and bringing matter into historical epistemology; Dagognet pulled further away from idealism, and attached more importance to matter. He argued that matter has been neglected, and, to correct this, he shifted emphasis and point of view. Bachelard interpreted the history of science as a history of increased rationalisation; this rationalisation included matter. By contrast, Dagognet re-read the history of science and philosophy from the point of view of matter. He argued that modern science and technology lead us to conceive matter in a new way. The creation of artificial textiles is one of the many examples of how matter is created. Biomaterials show how the gap between life and matter has been bridged. The genome map for Dagognet is another example of the materiality of life. And again we delegate to machines – that is computers – operations that not long ago seemed exclusively human.³⁴ For him matter, life and thought are three strata of a unity.³⁵

In his journey towards an increased materialism, Dagognet followed the central precept of historical epistemology: that philosophy should follow science. For him modern science has shown the way for the rehabilitation of materialism. On this point, he often quoted Bachelard, especially *Le matérialisme rationnel*, but in fact he went well beyond this work as far as the concept of matter is concerned. Bachelard’s materialism is always rational, and for him rationality belongs to science. It is in *Le matérialisme rationnel* that Bachelard once again emphasised the anthropological split between the diurnal and nocturnal human being, between imagination et raison, and the corresponding two types of materialism, le matérialisme imaginaire et le matérialisme instruit. For him, there is a rupture épistémologique between these two types of materialism, just as there is a rupture épistémologique between connaissance commune et connaissance scientifique.³⁶ Only the

³¹ (Bachelard 1951).

³² (Bachelard 1972 [1953], p. 6).

³³ (Dagognet 1965a, p. 46).

³⁴ (Dagognet 1985a); (Dagognet 2000).

³⁵ (Dagognet 2000, p. 13).

³⁶ (Bachelard 1972 [1953]) (Bachelard 1986 [1949]).

matérialisme scientifique is a materialism that manipulates matter and produces matter. The nocturnal, poetic situation regards matter only as imagined substances, and it is in fact an imagined, and indeed immaterial materialism. Dagognet wrote about these two sides of Bachelard's work, and emphasised that they are expression of two worlds: the diurnal and rational world on the one hand, and the nocturnal and oneiric world on the other. Dagognet commented: 'Aucun raccord possible: ces deux mondes que Bachelard a explorés ne peuvent que s'exclure et se repousser....'.³⁷ He also remarked that the gap that Bachelard posed between rational and oneiric life in fact increased in his late works.³⁸ In contrast with Bachelard, Dagognet aimed to reconcile these two types of materialism. For him there is a materialism of chemistry and of technology, but there also is an authentic materialism in art, and indeed in all aspects of our lives.³⁹ Dagognet followed science, technology, production of merchandise, art and other human activities; for him the ruptures that Bachelard saw between these different domains appeared in fact far less clear-cut. I have emphasised that chemistry suggested to Bachelard a materiality that mathematics could not to Brunschvicg; a similar contrast could also be drawn between Bachelard's interest in poetry and Dagognet's interest in visual arts. The matter of visual arts is not imagined matter as is that of poetry. Like Brunschvicg and Bachelard before him, Dagognet aimed to overcome the dichotomy of reason and reality. In order to do so, he considered the issue from the point of view of matter, which he no longer considered as subordinated to reason. In other words, he continued the trend towards materialism that can be traced from Brunschvicg to Bachelard.

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³⁷ (Dagognet 1965b, p. 61).

³⁸ (Dagognet 1965b, p. 62).

³⁹ See for instance (Dagognet 1989); (Dagognet 1985a).

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