

**when memory flows into  
reason: outline of an  
epistemology symmetrized**

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INTRODUCTION<sup>1</sup>

Let me arrive at Bachelard by a short detour that will take us far away from his interests while still remaining close to his way of thinking. In 1746 in his *Essay on the Origin of Human Knowledge*, Etienne Bonnot de Condillac, “the French Locke” as he is sometimes called, develops an objection against Descartes’s methodological doubt. For Condillac, Descartes’s deconstruction of acquired knowledge eventually fails to clear the ground on which true knowledge is supposed to be rebuilt:

Descartes was right to think that in order to gain certain knowledge we must begin with the rejection of all the knowledge we believe we have acquired; but he was wrong when he thought that it was sufficient to doubt that knowledge. To doubt if two and two are four, whether man is a rational animal, amounts to having ideas of two, of four, of man, of animal, and of rational. Thus doubt leaves the ideas subsisting such as they are; therefore doubt is no remedy, since our errors have their source in wrongly framed ideas. It can make us suspend judgment for a while, but in the end we do not escape from uncertainty except by consulting the ideas which doubt has not yet destroyed, and it follows that they will lead us astray as before if they are vague or poorly determined. So Descartes’ doubt is ineffectual.<sup>2</sup>

Indeed, for Condillac Cartesian doubt is not radical enough, as it only reaches the *validity* of our ideas, leaving their “material” intact.<sup>3</sup> Such doubt is “useless” (in the citation above, Hans Aarleff translates “*inutile*” as “ineffectual”) for it is too superficial. Since the very bases of our ideas fail to be attained, what was put into quarantine recovers altogether and regains its initial form, which is falsely rehabilitated because it was never truly challenged.

A very simple idea can be preserved from Condillac’s argument: to credit some piece of knowledge with the mark of *invalidity* is not always sufficient for eliminating it, even temporarily, from our mind. If I wish to highlight the fact that the same observation is inherent to Bachelard’s work and, as we shall see, even explicitly commented by him, it is not because my intention would be to set this view at the heart of Bachelard’s epistemology. I believe nevertheless that by focusing on the resistance deployed by diverse elements of science that were disallowed as *invalid*, we are susceptible to expanding historical epistemology’s range of competency. Amplified in this sense, and with the help of an entirely internal source of Bachelardian epistemology, historical epistemology could find itself “symmetrized” and, by the same way, markedly strengthened.

#### THE “POLYMORPHIC” NATURE OF THE NOTION OF “EPISTEMOLOGICAL OBSTACLES”

*The Formation of the Scientific Mind* (1938)<sup>4</sup> offers an inventory of epistemological obstacles that the human mind, but also the mind of presumably every individual, has (had) to overcome on its way to scientificity. This, at least, is how Bachelard’s book is usually presented: Bachelard identifies what obstructs the advent of science, and what keeps the mind in its ante-scientific condition. Although the list that Bachelard establishes is not intended to be exhaustive, it is meant to be representative enough to place the new object of the *epistemological obstacle* on the map of relevant epistemological problems.

Cristina Chimisso is certainly right to point out that *The Formation of the Scientific Mind* is basically not about the *progress* of the scientific mind or of science itself.<sup>5</sup> Bachelard is nevertheless certainly not rejecting the idea of progress: in effect, he claims allegiance to the 19<sup>th</sup>-century French positivist Auguste Comte and finds inspiration in a Comtian hierarchy of different, historically constituted manners of knowing. In a way, Bachelard extends Comte’s three-stage model: if the theological and metaphysical periods in the history of human knowledge laid down

by Comte find themselves dissolved by Bachelard into a single pre-scientific era (stretching from Antiquity to the 18<sup>th</sup> century), then the Comtian positive stage is, on the contrary, split in two by Bachelard's distinction between the scientific mind (from the end of 18<sup>th</sup> century to the beginning of the 20<sup>th</sup> century) and the stage of the *new scientific mind* launched by Einstein's theory of relativity and unknown, of course, to Comte. We can here leave out the question whether the principles of Comte's epistemology make it ready for such a development. In any case, in *The Formation of the Scientific Mind* Bachelard considerably reduces the real scope of his analysis when he places himself on the very edge of pre-science so that he might observe and qualify its inertia.

Alongside to the image of a barrier preventing the advent of science, another understanding of Bachelard's concept of the epistemological obstacle can be put forward, and the global appreciation of *The Formation of Scientific Mind* consequently modified. It is Dominique Lecourt who, in *Gaston Bachelard's Historical Epistemology*, points out—rather inconspicuously indeed—that the *place* of the epistemological obstacle in the knowledge process is susceptible to variation:

It can arise at the moment of the constitution of the knowledge, or at a later stage in its development, once it has already been constituted as a scientific knowledge. In the first case it can be said to be a “counter-thought,” in the second a “suspension of thought” (*arrêt de pensée*). [...] In other words, I shall say that in one case [the epistemological obstacle] prevents scientific thought from arriving, in the other, when it has already arrived, it demotes it to the rank of ordinary thought. For everything, ultimately, amounts to the re-establishment of the broken continuity between scientific thought and ordinary thought.<sup>6</sup>

I find this distinction remarkably far-reaching. Lecourt emphasizes that in both cases the obstacle stems from pre-science. In both his versions, the function of the epistemological obstacle is the same, as it corresponds to “a point of resistance of thought to thought”. This conflict can nevertheless occur in two different situations that assign to the epistemological obstacle the role of either obstructing scientific thought in the process of seizing power, or of intruding ordinary thought—in fact the term *non-scientific thought* sounds to me better suited to the variability of historical examples that Bachelard discusses—into science as already constituted. In this second sense, then, instead of preventing the advent of science, the epistemological obstacle *causes* a local impurity within already-

established science.

It is crucial to realize that for Bachelard, this intrusion of the past (within the general historical framework that Bachelard sketches, pre-scientific thought indeed acquires this temporal locus) into the “present” (i.e. into scientific knowledge) can occur despite the scientist’s vigilance. It is precisely this insight that calls to mind Condillac’s critique of Descartes referred to in the introduction of this paper. By the same token the “no” so valued by Bachelard since it is required by all scientific renewal shows its problematic side.

### EXAMPLE 1: RATIONALIZATION ON AN ABSURD BASIS

Unfortunately, and it would be unfair if we forgot to mention it, illustrations of “ordinary thought” contaminating scientific knowledge already constituted are quite rare in *The Formation of the Scientific Mind*. We will look at two examples of this manifestation (should we say *type*?) of epistemological obstacle, which Bachelard treats in some detail even though he does so as part of his general search and without distinguishing between them and obstacles of the first kind (i.e. obstacles to the arrival of scientific thought).

The first example is drawn from the history of medicine and pharmacology. In chapter VII of *The Formation*, which engages in “psychoanalyzing realists,”<sup>8</sup> Bachelard discusses the issue of abusive transfers of the economic value that certain materials, such as gemstones, habitually acquire, which used to result in their valorization within contexts a priori disconnected from the sphere of merchant exchanges. Precious stones are thus empowered with precious healing powers that ensure them an astonishing longevity within pre-scientific medicine: “Even when a critical spirit comes into being, it still respects the value it is attacking. [...] Even when beliefs are denounced as superstitious, they have to be looked at a second time in order to be sure that the writer is rid of them.”<sup>9</sup>

The *hesitations* of the French chemist and physician Étienne François Geoffroy (1672–1731) are discussed by Bachelard as a representative example of this arduous conversion to scientificity: Despite his doubts about the merit of traditional theories regarding the therapeutic powers of precious stones, Geoffroy fails to truly put these age-old speculations aside. Even if he has a clear idea about the superstitious nature of these theories, he decides to retain what he presumes to be their robust core. For Geoffroy, in spite of the lack of evidence, the wisdom of

the ancients must be preserved:

“We must not therefore proscribe precious stones from Pharmacy’s compositions without good cause,” he affirms, “for they have been accepted for many years and approved by long and blessed patience.” And so we have to respect a science we do not understand!<sup>10</sup>

As Bachelard remarks, Geoffroy shows himself just as respectful towards the knowledge of Arabs who attributed curative virtues to the gold. Gold’s beneficial qualities are explained by Geoffroy with arguments nourished by the force of analogy, artfully mixed with modern materialism: the Sun restores life to all of nature; the Sun is the source of the sulphur contained in the gold; gold, which is incorruptible, preserves blood from all corruption when it is mixed with it, and restores human nature just as the Sun does. Nevertheless, as Bachelard points out, Geoffroy hesitates before accepting these propositions. And this hesitation is, in the eyes of Bachelard, the very sign of continued subjugation to the pre-scientific mind:

Geoffroy is no doubt reluctant to accept such convergences; however, this reluctance is in fact characteristic of the pre-scientific mind. It is this reluctance that prompts us to say that pre-scientific thought is encountering an obstacle here which, while not yet surmounted, is in the process of being so.<sup>11</sup>

Despite these words, which seem to keep Geoffroy outside the bounds of scientificity, Bachelard doesn’t really feel the need to settle whether Geoffroy should still be counted among the ancients. Mainly, he is curious about Geoffroy’s hesitation, which possibly situates him “in-between” the two epochs, which is an excellent position from which to observe the hard (and basically collective) work required in order to overcome “superstition.”<sup>12</sup>

Realism<sup>13</sup> prevents Geoffroy from abandoning an ancient theory that he would have all the reasons to dismiss. It is indeed this very fact that, in this example, traditional knowledge is not allowed to enter uncritically, which conducts me to interpret it as an illustration of the “epistemological obstacle” accepted within its second meaning (i.e. as having for effect the intrusion of the ancient knowledge into new science). Although preserved, the past knowledge is *revised* and *transformed*. Bachelard affirms this very explicitly: Geoffroy’s case illustrates the

situation in which “more or less accurate experience joins up with completely erroneous tradition despite very strong criticism.”<sup>14</sup> Critical distancing is already at work, and even if it fails, it is not without effect:

Writers first of all feel the need to note these beliefs, for keeping silent here would doubtless disappoint their readers and breach the continuity of culture. Then however—and this is more serious—writers often take upon themselves the task of *partially* rectifying these beliefs, thus bringing about a rationalization on an absurd basis...<sup>15</sup>

On the basis of this example, I would like to formulate the hypothesis that the science of the past does not infiltrate the new science in any simple way, but penetrates it *transfigured* (and that, of course, makes it more difficult to track).

## EXAMPLE 2: INVALID INVALIDATION

Let us come to our second example of epistemological obstacles that disrupt the scientific thought, and cause the “induration of old beliefs.”<sup>16</sup> Bachelard’s discussion, in chapter IV of *The Formation*, of the “abusive extension”<sup>17</sup> of the image of *sponge* offers a new insight into the mechanism of contamination of the new by ancient stereotypes. First, Bachelard describes the attractiveness of the term:

We now wish, in this short chapter, to be even more precise and consider an instance where a single image or indeed a single word constitutes the entire explanation. [...] Here though we shall be taking the simple word “sponge” and seeing that it allows the most varied of phenomena to be *expressed*. And because we are expressing these phenomena, we believe we are explaining them. We believe we know them because we recognize them.<sup>18</sup>

The function of the sponge is so clear that it doesn’t call for explanation; the sponge is thus ready for use as an *explanans*. René-Antoine de Réaumur’s account of the compressibility of air provides a good illustration. Bachelard extensively quotes from *Mémoires de l’Académie royale des Sciences* (1731) in order to show how willingly Réaumur accepts the image of sponge when arguing against Mariotte. But the most interesting moment in Bachelard’s analysis comes with the next step, when Réaumur seeks more liberty for the term “sponge,” claiming that a “sponge of the air” can of course be dissimilar to an ordinary sponge. Bachelard

comments:

Yet all his thought has developed from this image and cannot leave its primary intuition behind. When he wishes to erase the image, the image's function remains. [...] In other words while he is in the end very willing to sacrifice the sponge, he wishes to keep *spongiosity*.<sup>19</sup>

As a matter of fact, Réaumur refrains from raising the question of the composition of the air and, in so doing, avoids conflating “air” and “sponge” on the basis of their similar make-up. Nonetheless, he presumes that air and sponges share the same functional features: whatever the form of the “grains of air,” they can be penetrated by water just like a sponge.

Bachelard pursues his analysis with a couple of additional illustrations of a similar and even more explicit use of the image of the sponge by several “subaltern authors.” He creates interesting contrast by eventually arriving at Descartes, whom he sees as an example of a “very great mind [...] stuck, so to speak, in primary images.”<sup>20</sup> It could be assumed, nevertheless, that his account should be here more nuanced. For even if it was accepted by all that Réaumur's attempt to drift away from the common image of the sponge was only *verbal* (in fact we believe there are good reasons to be wary of this judgment)<sup>21</sup>, as Bachelard claims, we find the difference between his conscious effort to abandon the metaphor of the sponge and Descartes's explicit keenness to accept it significant. It may be that both authors were “stuck” in primary images, but these primary images do not seem to be allowed to enter their science through the same channels. Descartes (but not Réaumur), as Bachelard reminds us, considered the image of the sponge perfectly clear and distinct, and as such suitable for scientific explanation:

Descartes's confidence in the clarity of the image of the sponge is very symptomatic of this inability to bring doubt to bear on the detail of objective knowledge, to develop a discursive doubt that would wrench asunder all reality's bonds and images' every angle. General doubt is easier than particular doubt.<sup>22</sup>

Let us add that Descartes is not the sole target of these critical words. The motif of the “detail” that “philosophers” neglect is to be found at the heart of Bachelard's epistemological program in *The Philosophy of No*, published only two years after *The Formation of the Scientific Mind*. In this work, Bachelard condemns the “*integral* philosophy of the philosophers,” too monist and naïve in its prescrip-



tions, that needs to be completed by the “*differential scientific philosophy*”<sup>23</sup> sensitive to every *epistemological detail*.<sup>24</sup> It suggests not only that every notion, hypothesis, problem, experience or equation (the list is Bachelard’s) needs to be studied, but also—and more importantly—that every piece of any scientific construction should be given the chance to present its particular philosophy. This epistemologist’s cautious stance, however, should not be confused with careless tolerance. This is why Descartes’ credulous acceptance of the image of the sponge rightfully earns him Bachelard’s criticism.

Credulously or not, Descartes and Réaumur share the image of the sponge, and this very fact is sufficient for Bachelard to treat them on an equal footing. This continuity, as it was suggested, merits to be challenged. Unlike Descartes, Réaumur actually failed to overcome the power of the image of the sponge *despite* the fact that he was mistrusting its *validity* (Condillac is, in this respect, more lucid than Bachelard is when criticizing Descartes for having doubted too generally). In this respect, Réaumur’s situation appears to differ from that of Descartes: although repudiated, in the end the image of the sponge is maintained by Réaumur, since it is reconstituted, in the amended knowledge, in the seemingly desubstantialised form of *spongiosity*. For the scientist, but also for the epistemologist, this type of situation appears to be even more defying than the kind of full-on resistance that only the future deplures.

Identification of the ancient knowledge reemerging, in the new science, *transfigured*, constitutes a serious challenge. In a slightly different context, Bachelard discusses the same metaphor of the sponge in his “Lumière et substance” (1934), a short paper on the history of photochemistry, that has been longtime obtruded by the materialistic image of the light absorbed by the matter. The light combines with matter and communicates to it its properties (some even claim it provides a “substantial principle of colors”). The metaphor of the sponge proves to be particularly tenacious as it shows ready to transform itself and to adapt, with the metamorphosis of the “materialistic intuition” that supports it, to new conditions:

Materialistic intuition can, moreover, return under another more or less diverted form, under a more scientific aspect, leading one to imagine a pure and simple conservation of force or vibration, as one imagined in the eighteenth century a conservation of a specific fluid or substance.<sup>25</sup>



The idea of absorption (associated to the sponge) thus re-emerges in a new form when, for instance, the coal is supposed (according to George Stephenson that Bachelard comments) to “conserve” the light it has received during the day and to give it back on fire. As long as the image of the absorption is invoked as an answer, and not as a problem, the rational science is suspended by the immediate realism. And the sponge seems to be, for Bachelard, its object-fetish.

## THE PHILOSOPHY OF NO CHALLENGED

We have already conceded that examples of infiltration of ancient knowledge into new science, whether explicitly refuted or not, are rather rare in Bachelard’s book. And yet we have good reason to believe that this issue is by no means marginal in his mind. The next quotation comes from Bachelard’s foreword to *The Formation*:

Even in a clear mind there are dark areas, caverns still haunted by shades, and traces of the old remain in our new ways of thinking. The eighteenth century still lives secretly within us and may—alas—return. We do not see this as proving the permanence and fixity of human reason, as Meyerson thought, but rather as evidence of the somnolence of knowledge and the miserliness of cultivated minds that go over and over the same knowledge and culture and become, as all misers do, victims of the gold they so lovingly finger. We shall indeed show the improper endosmosis occurring when the assertoric is made to flow into the apodeictic and memory into reason.<sup>26</sup>

We find it also significant that Bachelard uses Plato’s allegory of the cave to prepare his readers to hear about non-scientific residues within scientific knowledge rather than about the mind’s inability to cross the border of positivity. All this should be seen as confirming the sincerity of the subtitle of *The Formation* which reads: *A Contribution to a Psychoanalysis of Objective Knowledge*, and provides the same message—it is the non-scientific within the scientific, more than non-scientific thinking preventing the advent of science, that preoccupies Bachelard.

The general exegesis of Bachelard’s book is nevertheless not my first interest. Instead, I wish to bring forward several suggestions concerning the possible developments of Bachelard’s observations. I find indeed the image of “improper endosmosis” occurring when “memory flows into reason”<sup>27</sup> highly evocative as it invites to complete, and even amend, the manner how Bachelard is usually understood.

In fact, this formula brings us beyond the situation of science disrupted by common knowledge (Lecourt's *ordinary thought*) and allows us to consider all cases in which, due to ordinary intuitions and natural<sup>28</sup> tendencies of human mind, the new knowledge is insufficiently secured in the face of the undesirable vitality of what was brought into disrepute. Once the possibility that the new science's "no" addressed at ancient science may be *challenged* accepted, several propositions can be formulated.

1. First, a piece of advice (a moral, if one prefers) for scientists; a plea for the kind of "epistemological vigilance" known to sociologists, however surprising this reference may sound. We take the term, of course, from *The Craft of Sociology*, an openly Bachelardian "handbook" by Pierre Bourdieu, Jean-Claude Chamboredon, and Jean-Claude Passeron.<sup>29</sup> Largely preoccupied with the contamination of the sociologist's work by "spontaneous sociology," it links up very explicitly with Bachelard's epistemology, which it applies and develops in order "to enable students of sociology to become better equipped to cope with the pitfalls of sociological research."<sup>30</sup>

An interesting tension, however, arises between this incentive to "epistemological vigilance," as it is addressed to individual researchers, and Bourdieu, Chamboredon and Passeron's critique of Bachelard's psychologism. For in the view of these authors, it is a mistake to ascribe (epistemological) errors<sup>31</sup> directly to knowing subjects. Errors are not to be directly imputed to persons; more likely they are functions of epistemological positions "that can only be fully understood in the social field in which they are put forward."<sup>32</sup> It may be answered, nonetheless, and however paradoxically may it sound, that to invite researchers to practice "epistemological vigilance" is not to deny, but on the contrary, to reaffirm the non-psychological theory of error. Proceeding from the conviction that the mind is never scientific in itself, the "vigilance" is supposed to rest not only on the "adequate knowledge of error" (inspired by Bachelardian epistemology) but also on the knowledge about "the mechanisms that can induce it"<sup>33</sup> (informed by the sociology of knowledge).

*The Craft of Sociology* does adhere to the therapeutic tone of Bachelard's psychoanalysis. After all, the sanative ambition of the book is announced—along with Bourdieu's and his collaborators' acerbic argumentative style—since its very first sentence:

In contrast to the tradition which draws the line at the logic of proof, refusing on principle to enter into the arcana of invention, thereby condemning itself to oscillate between a rhetoric of formal exposition and a literary psychology of discovery, we try here to provide the means of acquiring a mental disposition which is the precondition for both invention and proof.<sup>34</sup>

However, epistemological vigilance as an acquired mental disposition does not combat the researcher's own "idiocy."<sup>35</sup> Its inspiration is sociological: Instead of reforming scientist's morale, it helps him to take better control of his epistemic operations.

2. Other suggestions may be of interest for philosophers of sciences. We believe indeed that Bachelard's insights have not been fully expanded upon. One example where there is much room for following up on Bachelard is when studying the full trajectories of "officially" expired but still refractory knowledge. Lorraine Daston's proposition to survey the "biographies of scientific objects" could be seen as an analogous invitation, given that scientific objects (objects of scientific inquiry), as she insists, not only come into being but also pass away:

Sometimes they are banished totally from the realm of the real, as in the case of unicorns, phlogiston, and the ether. More often, they slip back into the wan of reality of quotidian objects, which exist but do not thicken and quicken with inquiry.<sup>36</sup>

Here the picture of *slipping into the wan of reality of quotidian objects* is very similar to the one evoked by Dominique Lecourt who, as we have seen, calls his readers' attention to the type of epistemological obstacle that "demotes [scientific thought] to the rank of ordinary thought." However, in light of our subsequent analysis, this *fear of the ordinary* may appear as based on too clear-cut distinctions. In fact, Bachelard's detection of the *improper endosmosis of memory into reason* suggests that repulsed or otherwise abandoned scientific objects sometimes embark on more complex paths. An identification of this phenomenon not only allows us to presume that outmoded scientific objects are not always withdrawn from scientific practice as easily as scientists would like; it also suggests that their *déclassement*<sup>37</sup> may take the form of a *gradual retreat* that is performed

*inside* the scientific enterprise. Within the special context of the history of chemistry, Michael Friedman, for instance, offers an excellent example of such a progressive retirement when identifying, among the models of molecules proposed at the end of the 19<sup>th</sup> century, “hybrids” that found themselves halfway between the fading use of paper (folded) models and the newly promoted iconic representations.<sup>38</sup>

Epistemology not only appears to be technically well disposed to take over this research field, it may also find some help in its exploitation for its better understanding of the heterogeneous structure of science. It was said that the scientist should commit himself to “epistemological vigilance” in order to better resist the resurgence of the past; the epistemologist, for his part, should have the ambition of discerning its forms and functions.

3. The program of exploring trajectories of *memory flowing into reason* requires a more conciliatory attitude than the one Bachelard manifested towards this type of irregularity. For him, “endosmosis” was always “improper” (*abusive*), and therefore its condemnation prevailed over its positive observation. Significantly enough, Bachelard’s successor at the forefront of French-style<sup>39</sup> historical epistemology, Georges Canguilhem, can be seen as someone who was inspired by the same indignation. While promoting a sharp distinction between science and *scientific ideology*, Canguilhem seems to uncompromisingly exclude the study of “repudiated knowledge” from the legitimate occupations of the epistemologist:

...the separation between ideology and science should prevent, in the history of science, the situation in which any element of ideology seemingly preserved would be placed in continuity with the scientific construction that has dismissed the ideology.<sup>40</sup>

Even if Canguilhem’s concern is somehow different from that of Bachelard (it is above all related to good practice in the history of science, which should be wary of false and superficial resemblances), his refusal to deal with “scientific ideologies” potentially dissuades the epistemologist to follow officially dismissed knowledge during its process of retreat.

An objection could be raised here at this point. Isn’t it true that in his 1969 conference “What is Scientific Ideology?,” from which our quotation

comes, Canguilhem chooses a rather compliant attitude vis-à-vis scientific ideologies? “A history of sciences that deals with a science in its history, considered as a painstaking purification of the *norms of verification*, cannot ignore scientific ideologies.”<sup>41</sup> Nevertheless, it is obvious that the purpose of this broadening of the scope of the historian’s investigations is not to study the history of scientific ideologies. It is significant that when Canguilhem wishes to give “a persuasive example of the process of destitution of a [scientific] ideology,”<sup>42</sup> he takes no interest at all, in his analysis, in any kind of historical *movement*. Thus, when Canguilhem discusses the work of the French philosopher and naturalist P. L. Maupertuis, he does so exclusively in order to censure Maupertuis’s inclusion into the history of genetics, which in Canguilhem’s view was legitimately inaugurated only by G. Mendel. To conclude, if scientific ideology needs to be addressed by the historian of sciences, it is first and foremost to say he will be able to better orient himself within the “integral past,” which is *en bloc* not worthy of his consideration.

Canguilhem’s treatment of Herbert Spencer’s evolutionism brings an additional and even more eloquent confirmation to our analysis. For Canguilhem, Spencer is an imposter: in fact, his “organicism” conceals just a weak relationship between the biological theories of his time, to which he regularly refers, and his own speculations, which are foremost politically motivated. In this case, *the process of the destitution of scientific ideology* is well evoked by Canguilhem, although very significantly, it is in the end handed over to sociology: scientific ideologies disappear when “historical conditions of possibility change.”<sup>43</sup> As was said above, we have good reasons to think that this transformation of the (epistemological) question of “how” into the question of “why” is far from being an accident.

Is epistemology in its traditional form inhibited by the over-valorization of *validity* that abusively informs its object? It is not our ambition to develop the question further at this time. After these short reflections inspired by Bachelard and Canguilhem, we simply wish to suggest that the value and the function of a “past” that slips in the “present,” a process that Bachelard views negatively, perhaps merits more and closer study in an empirical fashion.

## CONCLUSION: HISTORICAL EPISTEMOLOGY SYMMETRIZED

“What would happen if the humble workers of the proof, still and always reactive through the nature of trials and proofs, suddenly discovered the truth, unbelievable and bare: that the intimate motivation to explore, that the key to discovery, that the possible unveiling of true intuition, dwell neither in the competition nor in the desire to dominate, but in the rejoicing?”<sup>44</sup> This is how Michel Serres concludes his review, already cited, of Bachelard’s *The Formation of the Scientific Mind*, which he attacks for its therapeutical and moralizing character, but also—and here Serres aims at the very heart of Bachelard’s *philosophy of no*—for the assent it gives to the “malevolence” that dwells “in the root of the knowledge”<sup>45</sup> of occidental man: “To know is to hunt, conquer, violate, empower, destroy. [...] Knowledge is against: against nature, against its own understanding, against itself and against the past, against others, one by one and all together.”<sup>46</sup> The “rejoicing hypothesis” that Serres suggests as an alternative sounds, nonetheless, like something that adds more psychology to epistemology, which on the contrary needs to be lightened in this respect. Surprisingly enough, as Bachelard shows, it is the category of *validity* that sometimes appears to be overly psychologized. By the same token the efficiency of the “violence” with which science discredits and expels the non-scientific from its heart shows weakened.

Whether science progresses by refutations or whether its growth is powered by some kind of joyful energy is eventually an empirical question. In the same way, an empirical inspection is needed in order to learn more about the (potentially typical) trajectories of all these “epistemological details” that, even though acknowledged as invalid, continue to inform the science growing on their grave. Bachelard’s survey of “epistemological obstacles” as offered in his *The Formation of the Scientific Mind* can be interpreted as showing what the first steps on this path might look like. This is, at least, what I found in Bachelard’s analysis of Geoffroy’s and Reaumur’s thought, supported by illustrations of “epistemological obstacles” understood as causing abusive intrusions of pre-scientific knowledge into new science. Under a generalized form of *memory’s endosmosis into reason*, it was then suggested that epistemology could profit from disregarding the offence to reason thus caused when preparing better conditions for a thorough study of the relics of the past.

In the final analysis, it is perhaps Bachelard’s commitment to the value of scientific progress that caused him to be somewhat insensitive to the field of research

that we propose to explore systematically. It is my suggestion that accepting this new object of inquiry—the posthumous life of the discarded science—would not only allow to broaden epistemology’s range of action, but above all it could help epistemology to definitively shift its focus from the *triumphant* to the *living* science, and consequently strengthen its status.



## NOTES

1. I would like to thank the two anonymous reviewers for their insightful comments on the first version of this paper and their stimulating suggestions.
2. Étienne Bonnot de Condillac, *Essay on the Origin of Human Knowledge*. Translated and edited by Hans Aarsleff. Cambridge: Cambridge University Press, 2001, Part II, Section 2, §33, 210–211.
3. For a closer analysis of this point, see André Charrak, *Empirisme et métaphysique. L'Essai sur l'origine des connaissances humaines de Condillac*. Paris: Vrin, 2003, esp. 118–122.
4. Gaston Bachelard, *The Formation of the Scientific Mind. A Contribution to a Psychoanalysis of Objective Knowledge*. Trans. Mary McAllester Jones. Manchester: Clinamen Press, 2002.
5. Cristina Chimisso, *Writing the History of the Mind. Philosophy and Science in France, 1900 to 1960s*. Aldershot: Ashgate, 2008, 144.
6. Dominique Lecourt, *Marxism and Epistemology: Bachelard, Canguilhem and Foucault*. Trans. Ben Brewster. London: NLB, 1975, 65.
7. Lecourt, *Marxism and Epistemology*, 65.
8. “Psychoanalysing realists” is the title of the chapter VII, 136–153.
9. Bachelard, *The Formation*, 138.
10. Bachelard, *The Formation*, 139.
11. Bachelard, *The Formation*, 141.
12. “Exiling gold! How can it be said, calmly and collectedly, that gold does not bring health, that gold does not give courage, that it does not stem the flow of blood nor dispel the phantoms of the night, the burdensome memories arising from the past and from our errors, that gold is not the ambivalent wealth protecting both heart and soul? For this, real intellectual heroism is required, and an unconscious that has been psychoanalysed, that is to say a scientific culture completely removed from any unconscious valorization. The pre-scientific mind of the eighteenth century has not achieved this freedom to judge.” (Bachelard, *The Formation*, 141–142)
13. “Realism” gains a specific meaning in this discussion. It combines “substantialist convictions” with a “miser’s joy” of possessing the riches of the reality that has to be jealously guarded. This is how the preciousness of precious stones undergoes a “mutation of values” and reappears in their healing power. See Bachelard, *The Formation*, 136–137.
14. Bachelard, *The Formation*, 138.
15. Bachelard, *The Formation*, 139, emphasis in the original text.
16. Bachelard, *The Formation*, 138. Notice that Bachelard doesn’t speak about the hardness or the resistance of old beliefs; he chooses instead the medical term “induration” in order to indicate that what he has in mind is a *reaction* to the critical re-examination of ancient beliefs.
17. “Extension abusive” is the French expression Bachelard uses in the subtitle of the Chapter IV. The complete title of its English translation gives: “An example of a verbal obstacle: sponge. On the over-extension of familiar images.” See Bachelard, *The Formation*, 81–90.
18. Bachelard, *The Formation*, 81.
19. Bachelard, *The Formation*, 83. A similar formulation is to be found in Bachelard’s *Psychoanalysis of Fire*: “We are never completely immune to the prejudice that we spend a great deal of time in attacking.” (Gaston Bachelard, *The Psychoanalysis of Fire*. Trans. Alan C. M. Ross. London: Routledge

& Kegan Paul, 1964, 65.

20. Bachelard, *The Formation*, 86.

21. Bachelard discusses the metaphor of the sponge in the fourth chapter of *The Formation* as a representative illustration of “verbal obstacles” to scientific mind to which the chapter is dedicated. Although he speaks, in the very first paragraph of this chapter, about “purely verbal habits” that hinder scientific thought, Réaumur’s case seems to prove that it would be a mistake to charge the word itself with full responsibility for postponing the entering into scientificity. According to Bachelard, Réaumur’s dropping of the word “sponge” is “simply and solely a linguistic movement” (Bachelard, *The Formation*, 83), i.e. nothing more than a linguistic movement. Erasing the word doesn’t therefore constitute a notable step forward. I tend to disagree with this judgment. Even if the disappearance of a word cannot here count for an “epistemological act” as Bachelard understands it (as an unexpected impulsion intervening in the scientific development, see Gaston Bachelard, *L’activité rationaliste de la physique contemporaine*. Paris: Presses universitaires de France, 1951, 25), it is likely to produce what we suggest to call an “epistemological event,” given that some important part of the control on the *image* structuring the thought is lost.

22. Bachelard, *The Formation*, 86.

23. For Bachelard’s use of the term “scientific philosophy” compared to that of the Vienna School, see Sandra Pravica, “‘Scientific Philosophies’ in the early 1930s and Gaston Bachelard on ‘induction,’” *Epistemology and History from Bachelard and Canguilhem to Today’s History of Science* (preprint), Max Planck Institute for the History of Science, 2012, 159–169, available at: <https://www.mpiwg-berlin.mpg.de/Preprints/P434.PDF>

24. For Bachelard’s epistemological program, see especially the foreword of *The Philosophy of No* (Gaston Bachelard, *Philosophie du non*. Paris: Presses Universitaires de France, 1983, 1–17)

25. Gaston Bachelard, “Lumière et substance,” (1934) in *Etudes. Présentation de G. Canguilhem*. Librairie philosophique J. Vrin, Paris 1970, pp. 45–75.

26. Bachelard, *The Formation*, 19.

27. Bachelard, *The Formation*, 19. Bachelard borrows the term “endosmosis” from biology where it denotes the phenomenon of penetration of a substance from the external milieu into a closed system.

28. Here I follow Dominique Lecourt who calls our attention to the figure of Nature that Bachelard put forward. With regard to *The Formation of scientific mind*, Lecourt remarks: “Apparently, Bachelard does not care, here, about the effective history of the sciences in the 18th century. What is given to us to decipher in these texts [studied by Bachelard], it is the mythical figure of a ‘natural state’ of the scientific mind: quite at the same time native and trans-historic state where can be read, in a straightforward manner, the essence of a mechanism, today veiled by its own manifestation.” (Dominique Lecourt, *Bachelard. Le jour et la nuit*. Paris: Bernard Grasset, 1974, 127–128)

29. Pierre Bourdieu, Jean-Claude Chamboredon, Jean-Claude Passeron, *The Craft of Sociology. Epistemological Preliminaries*. Trans. Richard Nice. Berlin—New York: Walter de Gruyter 1991. The book, which was originally published in 1968, represents an astonishing attempt to apply Bachelard’s epistemology to social sciences. Bourdieu, Chamboredon and Passeron do not deny that such an undertaking may cause some difficulties, but they are convinced that these are to be studied instead of nourishing “artificial distinctions” between natural and social sciences.

30. Bourdieu, Chamboredon, Passeron, *The Craft of Sociology*, v. Yves Gingras notes that Bachelard himself speaks, in a similar context, about an “intellectual watch on oneself” (*surveillance*

*intellectuelle de soi*). See Yves Gingras, “Réflexivité et sociologie de la connaissance scientifique” in L. Pinto, G. Sapiro, P. Champagne (eds), *Pierre Bourdieu, sociologue*. Paris: Fayard, 2004, 338 (337-347).

31. “Errors” are here to be understood as misconducts in relation to the true scientificity.
32. Bourdieu, Chamboredon, Passeron, *The Craft of Sociology*, 3. In fact, Bachelard is not completely ignorant of that. Consider his commentary on Geoffroy: “Exiling gold! How can it be said, calmly and collectedly, that gold does not bring health, that gold does not give courage, that it does not stem the flow of blood nor dispel the phantoms of the night, the burdensome memories arising from the past and from our errors, that gold is not the ambivalent wealth protecting both heart and soul? For this, real intellectual heroism is required, and an unconscious that has been psychoanalysed, that is to say a scientific culture completely removed from any unconscious valorisation. The pre-scientific mind of the eighteenth century has not achieved this freedom to judge.” (Bachelard, *The Formation*, 141–142).
33. Bourdieu, Chamboredon, Passeron, *The Craft of Sociology*, 3.
34. Bourdieu, Chamboredon, Passeron, *The Craft of Sociology*, 5 (the excerpt quoted actually corresponds to the first sentence of the introduction to the French edition of the book: Pierre Bourdieu, Jean-Claude Chamboredon, Jean-Claude Passeron, *Le métier de sociologue. Livre I*. Paris: Mouton/Bordas, 1968, 23).
35. The term is M. Serres’s: “A new great book about the idiocy: The Formation of the Scientific Mind.” (Michel Serres, “Déontologie : La réforme et les sept péchés” in M. Serres, *Hermès II : L’Interférence*. Paris: Les éditions de Minuit, 1972, 203 (201–222).
36. Lorraine Daston (ed.), *Biographies of Scientific Objects*. Chicago: Chicago University Press, 2000, 13.
37. The term is used by Dominique Lecourt in the text quoted above, where the original verb “déclasser” is translated by “to demote.”
38. Michael Friedman, “A Failed Encounter in Mathematics and Chemistry: the Folded Models of van ’t Hoff and Sachse.” *Theory of Science*, 37:3 (2016, 359–386). The issue 3/2016 of the journal *Theory of Science* is entirely devoted to the problem of *transformation, degradation, and disappearance of scientific objects*. See: <http://teorievedy.flu.cas.cz/index.php/tv/issue/view/32>
39. Here I refer to Jean-François Braunstein’s observation that French historical epistemology, even in its best years, wasn’t united by any shared research program but rather by a single *style* of the research. See Jean-François Braunstein, “Bachelard, Canguilhem, Foucault. Le ‘style français’ en épistémologie,” *Les philosophes et la science*. Ed. Peter Wagner, Paris: Gallimard, 2002, 921–963.
40. Georges Canguilhem, “Qu’est-ce que l’idéologie scientifique ?,” in G. Canguilhem, *Idéologie et rationalité dans l’histoire des sciences de la vie*. Paris: Librairie philosophique J. Vrin, 2000, 45.
41. Canguilhem, “Qu’est-ce que l’idéologie scientifique ?,” 44–45.
42. Canguilhem, “Qu’est-ce que l’idéologie scientifique ?,” 40.
43. Canguilhem, “Qu’est-ce que l’idéologie scientifique ?,” 43.
44. Serres, “Déontologie : La réforme et les sept péchés,” 222.
45. Serres, “Déontologie : La réforme et les sept péchés,” 221.
46. Serres, “Déontologie : La réforme et les sept péchés,” 221.