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Ian Hacking – Special Issue

Ian Hacking's Rewriting of *Leviathan and the Air-Pump*

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Abstract:

Ian Hacking has argued that the book *Leviathan and the Air-Pump* acted as a historiographical source in his analysis of the laboratory style of thinking and doing. The present article analyzes Hacking's appropriation of Shapin and Schaffer's work as a rewriting of the history of English experimental philosophy of the seventeenth century. The analysis focuses on the contingency/permanence tension with the aim of investigating the two historiographic narratives as attempts to overcome what Bernstein calls "Cartesian anxiety." First, I examine the mundane historiography of Shapin and Schaffer and their philosophical commitment to finitism as constitutive of their historiographical approach. Second, I analyze Hacking's appropriation of Fernand Braudel's historiography in writing a material history of experimental philosophy. Finally, I address the notion of form of life as a nuclear point in the ways that Hacking and Shapin and Schaffer seek to move beyond Cartesian anxiety.

Keywords: Contingency and Permanence in Historiography of Science; Form of Life, *Leviathan and the Air-Pump*; Hacking; Shapin and Schaffer.

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Introduction

In this article, I propose to examine Hacking's appropriation of the work of Shapin and Schaffer (1985) as a rewriting of the history of the English experimental philosophy of the seventeenth century. Hacking affirms that, although his project about styles of thinking and action is not a historical investigation, he has appropriated new historiographic ideas, such as those developed by Shapin and Schaffer (Hacking 2012, 603). This consideration makes sense within the Hackinean project that seeks to combine the work of philosophers, historians and sociologists with the objective of understanding scientific practice. It is not an attempt to problematize disciplinary boundaries or to rethink the interdisciplinarity of meta-scientific studies. Hacking aims to promote a historical philosophy of science that builds links between social dimensions, metaphysics (philosophical conceptions of truth, reality, logic,

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meaning and knowledge) and a long-term, "Braudelian" aspects of science (Hacking 1992a). In the elaboration of this plot, Hacking has questioned and resignified the sociology of scientific knowledge of the Edinburgh School. Some of the theses postulated by this sociology, as well as their consequences for the historiography of science, have been significant for the way in which Hacking argues with Shapin and Schaffer, not only about the past of science, but also about what constitutes an adequate representation of the same.

The problematization of the rewriting of the past, in history, philosophy and theory of history, refers to the historical nature of knowledge of the past. The different perspectives agree on the relevance of the notion of rewriting to understanding the task of the historian. Collingwood's statements in defense of the rewriting of the past continue to provide clarity,

> every new generation must rewrite history in its own way; every new historian, not content with giving new answers to old questions, must revise the questions themselves; and – since historical thought is a river into which none can step twice – even a single historian, working at a single subject for a certain length of time, finds when he tries to reopen an old question that the question has changed. This is not an argument for historical skepticism. It is only the discovery of a second dimension of historical thought, the history of history, the discovery that the historian himself, together with the here-and-now which forms the total body of evidence available to him, is a part of the process he is studying, has his own place in that process, and can see it only from the point of view which at this present moment he occupies within it. (Collingwood 1994, 247)

The analytical philosophy of history also took up the question of why history was rewritten. Mink maintains that,

> each generation rewrites its own history, the saying goes. In popular form, this is one expression of historicism, the view that historical truth is relative to the point of view of the historians together, perhaps, with his primary audience. But it is seldom added that each generation gives itself its own reason for rewriting its own history, so there is a history of historicism itself. (Mink 1987, 89)

The historicity of the writing and rewriting of history reveals the controversial nature of the study of the past. The coexistence of contradictory interpretations of the past events themselves cannot be resolved by discarding interpretations on the basis of the accusation of flaws in the work of historians or by pointing out the discovery of new and decisive evidence. Historical controversies dispute the past and the epistemic and ethical commitments implied in representations of the past (White 1973). The writing and rewriting of the past exhibit an irresolvable conflict. Since it is impossible to reach a definitive consensus about the past, a polemical pluralism inevitably unfolds in history as well as in philosophy and the theory of history. What is at stake here are alternative realistic strategy options and their ethical and epistemic commitments rather than the value of the evidence as such (Tozzi Thompson 2021).

In this context, it is worth asking: What is at stake in Hacking's rewriting of the experimental philosophy of the seventeenth century? I find it fruitful to frame the validity and relevance of Hacking's reception of Shapin and Schaffer's work in light of the problem that Richard Bernstein (1983) postulates as "Cartesian anxiety". Bernstein proposes reading the Cartesian *Meditations* as a journey of the soul in search of a stable rock on which to affirm our lives in the face of the vicissitudes that threaten us. What lies in the background of that journey is the terror of madness and chaos in which we can neither touch the bottom nor rest on the surface. Descartes leads us to an exclusive disjunction. Cartesian anxiety seems to lie at the very center of our being in the world. This is why Bernstein considers it a duty to

exorcise it if we want to go beyond the limiting dichotomies of our philosophical task. Cartesian anxiety underlies a set of oppositions – objectivism-relativism; realism-antirealism; scientific representation-scientific practice – that dominated the scenarios of philosophy and the social studies of science in which Hacking, Shapin and Schaffer participated. These authors have presented serious attempts to transcend these dichotomies so as to understand scientific practice and its past. The writing and rewriting of seventeenth-century English experimental philosophy is evidence of such attempts.

It is also worth asking why Hacking's appropriation of *Leviathan and the Air-Pump* should be considered a rewriting of the history of science if he himself affirms that his work is not part of history but rather of the historical philosophy of science. As an answer to this question, I take Hayden White's words in *Metahistory* (1973). White argues that history and the philosophy of history are only distinguishable in emphasis but not in content. In proper history, the element of construction has moved into the narrative, while "found" data occupies a prominent position in the story line. On the other hand, in the philosophy of history, the element of conceptual construction is placed in the foreground, is stated explicitly and is defined systematically. The data is now used for the ends of illustration or exemplification. The philosophers of history seek both to understand what happened and to make explicit the criteria by which they can know when they have managed to grasp its significance. However, White concludes that every philosophy of history contains within itself the elements of a proper history, just as every proper history contains within itself the elements of a fully developed philosophy of history.

Certainly, Hacking's styles project can be considered a philosophical exploration of the conditions of possibility of scientific thinking and of the emergence of scientific objects. Hackinean historical philosophy makes explicit how the styles of scientific thinking and doing have developed in their own way, in their own time frame, and have contributed in various ways to the larger fabric of scientific imagination and action (Hacking 2009). For its part, the history that Shapin and Schaffer write is a story that displays the contingent and disputed character not only of scientific knowledge but of all historiographic production.

The article is structured through tension contingency/permanence. I first develop the philosophical commitments in the story of Shapin and Schaffer that underlie the narrative of the dispute between Boyle and Hobbes over the ways of doing English natural philosophy in the seventeenth century. Here, Wittgensteinian finitism lies beneath the creation of a "mundane" history of science. Secondly, I analyze Hacking's appropriation of Fernand Braudel's *longue durée* in order to configure a historical philosophy of science that energizes permanence. Hacking reconstructed his rewriting of seventeenth-century English experimental philosophy as a narrative that places materiality at the center. His aim is to explore the dialogue between contingency and permanence. I finally address the notion of form of life as a core aspect in how Hacking, Shapin and Schaffer attempt to go beyond Cartesian anxiety.

A Tension between Contingency and Permanence

This tension is structured around the sociology of scientific knowledge, developed by Barry Barnes and David Bloor. Hacking considers this sociology as the counterpoint to a philosophy that has lost interest in how we find out, in the details of how scientists actually carry on their work (Hacking 1992a). However, the virtuous point of these social studies of science – the multiplication of diversity – constitutes at the same time a limit for the elaboration of a historical philosophy such as the one Hacking has in mind. The sociologists of scientific knowledge "leave us in the lurch with a feeling of absolute contingency. They give little sense of what holds the constructions together beyond the networks of the moment, abetted by human complacency" (Hacking 1992a, 131).

Hacking outlines a contrast between, on the one hand, a history and sociology that account for scientific practice by emphasizing the contingency of events and, on the other, a historical philosophy that provides an analysis of persistence: "We are beginning to know a great deal of the microhistory and microsociology of this or that scientific incident, but I am interested in a larger view, philosophical and anthropological, of scientific reason in the life of our species" (Hacking 2009, 3).

In this search, Hacking points out the power of Braudelien *longue durée* accounts of the past. Braudel's narrative underlies the distinction that Hacking draws between the contingencies of the air-pump – central to the work of Shapin and Schaffer – and the contingencies of the new laboratory, which he wants to address. Nothing makes the emergence of a style of scientific thinking and doing necessary. However, Hacking aims to highlight "the way that laboratory reasoning has become autonomous of its promiscuous beginnings that are so well recounted in this book [*Leviathan and the Air-Pump*]" (Hacking 1991, 236).

Also, Braudel plays a role in the displacement that Hacking effects in the theme of *Leviathan and the Air-Pump*. According to Shapin and Schaffer, the book addresses the controversy between Thomas Hobbes and Robert Boyle around the scientific method "as disputes over different patterns of doing things and of organizing men to practical ends" (Shapin and Schaffer 2011, 15). With *The Mediterranean and the Mediterranean World in the Age of Philip II* (1972) in mind, Hacking rewrites history with a new hero. His story tells the life of a device, the air-pump, that creates effects that did not previously exist in isolation (Hacking 1991; 2006; 2009). His narrative focuses on the material side of what is done in science (Hacking 1992a).

I take up the figures of mundanity and discordant harmony in order to approach the philosophical commitments of the historiographies of Shapin and Schaffer (mundanity) and Hacking (discordant harmony). The mundane history of science has its roots in sociology's finitist conception of scientific knowledge, while Braudel's narrative is the background to the story of Hacking's non-human hero and the emergence of the laboratory style.

A Worldly Historiography

The widely cited slogan in the field of social studies of science: "Solutions to the problems of knowledge are solutions to the problems of social order" (Shapin and Schaffer, 2011, 332), is shorthand for a mundane historical narrative. This mundaneness (Shapin 1999) accounts for both the historical specificity and heterogeneity of whatever might count as science. Heterogeneity points in the direction of the multiplication of diversity in the practices and elements that come into play in each local realization of scientific knowledge. By contrast, the historical specificity focuses on the conventional and contingent ways in which these multiplicities were configured. Both explore "whether those tough nuts could be cracked by more and more detailed, and more contextually sensitive, accounts of scientific episodes (Shapin and Schaffer 2011; Shapin 2015).

The practice of history-making is governed by the mundaneness postulate (Shapin 1999). The historian must not prejudge what overt features of everyday scenes may or may not be relevant to making and justifying situated scientific knowledge. This postulate invites us to focus on the everyday and material aspects of scientific practice. In the field of social studies of science, these practices are investigated in the domains of the small, the intimate, the personal, the embodied and the emotionally textured, and often in the domains of the familiar and the face-to-face. So, if scientific knowledge is configured from common processes of interaction in mundane practices, making a history of scientific knowledge, of the scientific method or of truth is to tell stories about a set of practices with a lowered, situated, and embodied tone (Shapin 2010).

The finitist perspective developed by the sociology of scientific knowledge (Barnes, Bloor and Henry 1996; Bloor 1997; Barnes 1982) opens the door for historians of science to the investigation of the scientific practice of the past in its local particularities. Thus, mundane history of Shapin and Schaffer is the consequence of adopting this philosophical commitment.

Wittgenstein's ideas of language game and form of life are combined in the finitist account of the use of scientific knowledge. Finitism holds that there is nothing in the meaning of terms, nor in their previous uses, nor in the way in which these terms have been previously defined, that serves to fix their future appropriate uses.

Having said that, this vision cannot be reduced to a semantic analysis. All scientific practices, observing and representing, as well as experimenting and intervening, are contingent actions covered by finitism. According to the logic of finitism, scientists, as participants in a form of life, use the resources available in it. However, the form of life does not "make" the participants use those elements in one way or another. Forms of life neither constrain nor determine the actions of scientists. Rather, in using resources in one way or another they constitute the form of life (Barnes, Bloor and Henry 1996). All that remains is agreement on the practices. The conduct of an individual will be considered correct or incorrect, whether or not it conforms to the conduct on which the members of the community agree. In the words of Wittgenstein, "'So you are saying that human agreement decides what is true and what is false?'— It is what human beings *say* that is true and false; and they agree in the *language* they use. That is not agreement in opinions but in form of life" (Wittgenstein 1968, § 241).

This finitist view has been used as a resource within the history of the sciences. To account for the ways in which a society's members reckon that any specific performance counts as behaving in the same way or as the application of a precedent is precisely the task this history sets itself (Schaffer 2010).

For this sociological perspective on the work of Wittgenstein, each of the accepted applications and extensions of scientific knowledge has the character of a social institution as "things that have to be sustained in being on a moment-by-moment basis. They, too, do not and cannot exist independently, or in advance of, the acts of reference which constitute them" (Bloor 1996, 851). Every social institution refers to something created collectively through self-referential practices. Thus, social institutions are also subject to the dynamics of finitism.

According to the logic of finitism, the core question of *Leviathan and the Air-Pump* can be formulated as follows, "What does a seventeenth-century natural philosopher do when he expresses the rules of his method of inquiry?" Shapin and Schaffer's response clarifies the meaning of this "doing",

> we shall be concerned to show the connections between the conduct of the natural philosophical community and Restoration society in general. However, we also mean something else when we use the term "social context". We intend to display scientific method as crystallizing forms of social organization and as a means of regulating social interaction within the scientific community. (Shapin and Schaffer 2011, 14)

In the case of experimental philosophy, the performative act of sustaining a method entails the construction of a community in a physical space, the incipient laboratory. There, people relate through a diversity of practices not only to each other but also to natural entities and to artifacts as part of a form of life. At the same time that the methodological rules are configured, a type of knowledge is created, a community of reliable witnesses, who are spokespersons for the truth, and the promise of a new order, which English society expects from the restoration of the monarchy (1660). Thus, *Leviathan and the Air-Pump* strengthens the ties between the history of science and political history. This link is formed

through the conjunction between the material, the epistemic and the moral in the space of the air-pump.

The air-pump constituted a site where matters of facts were accessed but not their causes. Boyle proposed that matters of fact be established through the aggregation of individuals' beliefs. It was possible to have moral certainty only about matters of fact. For that process a multiplication of the witnessing experience was fundamental. The testimonies constituted the matter of fact as an epistemological-social category. This was possible thanks to the amalgamation of three technologies,

> experimental practices employing the material technology of the air-pump crystallized specific forms of social organization; these valued social forms were dramatized in the literary exposition of experimental findings; the literary reporting of air-pump performances extended an experience that was regarded as essential to the propagation of the material technology or even as a valid substitute for direct witness of experimental displays. (Shapin and Schaffer 2011, 26)

In this sense, matters of fact were social institutions and, as such, self-referential. Their ultimate foundation was given by the experimental form of life. Since consensus itself was vital to the establishment of matters of fact as the foundational category of the new practice, the experimental form of life was differentiated from the modes of knowledge-making that, at the same time, generated political conflict. Far from having a metaphysical character, the notion of emptiness worked in favor of a new political delimitation. The definition of the vacuum as an experimental space placed experimental philosophy at the center of the political problem of consensus and civil order. Through the air-pump, Boyle exhibited a new social order in the generation and justification of knowledge, one which could avoid civil war.

The testimony was configured in a type of social relationship which was constitutive of knowledge. The presence of a genuine state of nature was assured only through witnessing. Trust and authority had to be unavoidable components in knowledge-making. But then answering questions such as who could be considered a reliable witness, who could be a spokesperson for the truth, was an urgent matter.

Boyle constructed the identity of the spokesperson for truth on the basis of the integrity and independence of the virtuous Christian gentleman. The gentleman was obliged by the code of honor to be a spokesperson for the truth and not to lie to another gentleman. His ancestry and economic position granted him free action as a defining characteristic. In Boyle's case, his active testimony to the truth juxtaposed the gentry with Christian devotion. Thus, Boyle transferred these cultural resources to the experimental philosopher, strengthening the links between the moral and epistemic orders: "The experimental polity was said to be composed of free men, freely acting, faithfully delivering what they witnessed and sincerely believed to be the case. It was a community whose freedom was responsibly used, and which publicly displayed its capacity for self-discipline" (Shapin and Schaffer 2011, 339).

Given that the witnesses of matters of facts had to occupy the places where the experiments were carried out, the laboratory was established as a social space and, as such, a space of inclusion and exclusion. The site of the experiments had to be public. However, the meaning of "public" became problematic. Only the language game of experimental philosophy and its corresponding form of life could keep the boundaries secure: "Moreover, such free action was said to be requisite for the production and protection of objective knowledge. Interfere with this form of life and you will interfere with the capacity of knowledge to mirror reality" (Shapin and Schaffer 2011, 339).

Now, the emergence of experimental philosophy was controversial. Shapin and Schaffer's narrative offers the statements of Thomas Hobbes as a gateway to dismantling the limits of experimental philosophy. They are presented as openly deconstructive. The authors

want to play the stranger to experimental culture, the stranger is in a position to know that there are alternatives to native beliefs and practices. The historian, who pretends to be a stranger, is a figure opposed to the historians of science that look at the past from the self-evidence of knowing themselves to be members of the experimental tradition. Hobbes offers historian resources for playing stranger.

In the hands of Hobbes, each of the nuclear elements of experimental philosophy is vulnerable. The criticism of the public nature of the experimental space calls into question the foundations of the experimental facts, the social order proposed by experimental philosophers and their role as guarantors of civic peace.

Hobbes discussed this social character of the laboratory and denied the supposed equality proclaimed by experimental philosophers. Experiments were available only to a self-selected few. The number of members could easily be multiplied simply by making the decision to open up the Royal Society. The closed nature of the laboratory puts trust, authority and testimony in doubt.

Nor did he admit that the repeated performance of experiments could be taken as philosophy. For Hobbes, experimental philosophy was not philosophy. Machine designers were not to be considered philosophers. Philosophers were not to be equated with mechanical liars who produce "various spectacles". Experimental philosophy produced knowledge of an inferior type by relying on the intellectual processes of the craftsman and the mechanic.

Thus, Shapin and Schaffer's finitist history establishes no limits to the consideration of what may be relevant when analyzing the science of the past. Scientific controversies are an opportunity to explore the contingent resources that came into play in the generation of scientific knowledge: "In H. M. Collins' metaphor, institutionalized beliefs about the natural world are like the ship in the bottle, whereas instances of scientific controversy offer us the opportunity to see that the ship was once a pile of sticks and string, and that it was once outside the bottle" (Shapin and Schaffer 2011, 7).

Discordant Harmony

As in the case of Fernand Braudel, the problem that Hacking faces lies in how to deal with the historiographic difficulty of linking the durable phenomena of history with those that involve rapid change. In *The Mediterranean and the Mediterranean World in the Age of Philip II*, Braudel turns to the figure of the wave to account for the dynamism of the deep *longue durée* structure, the conjuncture and the events. The image of the wave is repeated in multiple ways, from the deep structures that are slow-furling waves with an extremely slow pattern of oscillation to surface disturbances, crests of foam that the tides of history carry on their strong backs (Braudel 1972). This history of events is "a history of brief, rapid, nervous fluctuations, by definition ultra-sensitive; the least tremor sets all its antennae quivering" (Braudel 1972, 21). However, the historian must learn to distrust this history with "its still burning passions, as it was felt, described, and lived by contemporaries whose lives were as short and as short-sighted as ours. Resounding events are often only momentary outbursts, surface manifestations of these larger movements and explicable only in terms of them" (Braudel 1972, 21). Braudel's story shows that the pure chain of events, which makes human beings believe that they are involved in matters of importance, is illusory. In Braudel's words,

> it is in relation to these expanses of slow-moving history that the whole of history is to be rethought, as if on the basis of an infrastructure. All the stages, all the thousands of stages, all the thousand explosions of historical time can be understood on the basis of these depths, this semi stillness. Everything gravitates around it. (Braudel 1982, 33)

Unlike Braudel, Hacking opts for the metaphor of sedimentation to rethink the relationship between the contingent and the stable within the styles of scientific reasoning,

> What once were shifting sands became what is experienced as rock-hard right reason. (…) [T]he sediment, hardened over a long time by great pressures into rock, is a collection of achievements founded on human ingenuity, innate propensities, and interaction with everything. Like any sedimentary deposit, it may undergo radical change in the future, but it cannot be undone. (Hacking 2012, 600)

This figure of sedimentation is a sign that Hacking gained access to Braudel's *longue-durée* through Foucault. *The Archaeology of Knowledge* begins by noting the transformations that had taken place in the field of historical knowledge. Historians have turned their gaze towards long periods, equilibria which are stable and difficult to break, irreversible processes, constant regularities. Fundamentally, the Annales School has developed new tools that have allowed historians "to distinguish various sedimentary strata (…). From the political mobility at the surface down to the slow movements of 'material civilization', ever more levels of analysis have been established (…), and as one descends to the deepest levels, the rhythms become broader" (Foucault 2004, 4). By contrast, the history of ideas, of science, of philosophy has shifted its attention towards discontinuities, ruptures. In both cases, historians no longer adhere to traditional periodizations and levels of events, but instead seek to define new trajectories in terms of new criteria.

With its gaze fixed on these bifurcations and with the help of Foucault, Hacking's historiographical narrative (2006; 2009; 2012) defends the complete consistency of linking the tale of systems of thought in terms of radical and almost instantaneous mutations to the magisterial versions of slowly moving centuries. The styles stabilize but also continue to evolve in an endless cycle of contingencies. The story, which Hacking writes, is not "quite that of a random walk, but there is no foreordained right route" (Hacking 2012, 600).

In this context, Hacking seems to be far from assuming an intermediate point of analysis between the contingent and the inevitable (Simos and Arabatzis 2021). I regard the discordant harmony of things expresses the Hackinean sensitivity. This harmony does not achieve the predominance of unity over differences, it does not dilute differences, nor does it maintain divisions without union. There is a continuous process in which tensions do not dissolve.

Discontinuous crystallization and continuous evolution act together as an oxymoron of a movement that never achieves completeness. Only when a style crystallizes do a multitude of real human beings collaborate to produce a new way of going on: "I like to tell the story of each style of scientific thinking as having at least one sharp moment of crystallization, a fixing of how to go on in the future, usually after centuries, perhaps millennia" (Hacking 2009, 14). Thus, the figure of crystallization is a condensed paradox. It highlights the radical change, the discontinuity in a style of scientific thinking and doing, but it does so by consolidating its emergence.

A style of thinking begins with the discovery of how innate capacities can be used in new ways to find out about something. But there is also a self-authentication process. For each style there is a class of sentences that are candidates for truth or for falsehood only in the context of that style. The only way to find out whether they are true or false is by using the relevant style. The criteria of truthfulness are determined by the style (Hacking 2009).

Now, the styles thrive and are popular for a time, and are eventually abandoned, become moribund and even extinct. The disappearance of a style is always caused by external forces. But what maintains some way of finding out must be its use in a cultural context. The styles evolve dynamically within human social interactions (Hacking 2009).

Let's go back to Braudel. I want to highlight two more elements that link him to Hacking. On the one hand, Braudel writes a history of the Mediterranean as part of a history

of material culture (agricultural techniques, habitat, domestic instruments, means of transportation, economic or demographic patterns of development). This story looks for practical and material effects. It is a history of everyday life and everyday things. Hacking feels an affinity for these ideas. He presents a materialist and interventionist vision of the stabilization of laboratory science (Hacking 1992). Intervention and interaction are the substances of reality. The Hackinean rewriting of the history of experimental philosophy focuses on the materiality of experimentation, a new kind of character, a new kind of place, a new kind of fact emerges (Hacking 1991, 2006, 2009, 2012).

On the other hand, Braudel starts from a myth, the late sixteenth-century Mediterranean world, "selected intuitively not for its centrality or representativeness but rather for 'its irregular position' within the group" (Kellner 1979, 218). Like every mythologist, Braudel "clusters around this 'reference myth' a whole series of twining nebulae, amorphously suggesting a certain order beneath the chaos" (Kellner 1979, 218). Hacking too uses a reference myth to account for the emergence of a style. The hero of the Hackinean story of experimental philosophy is not a person but a device that inhabits a new place, the laboratory, surrounded by other devices and instruments.

Hacking historicizes the air-pump. Unlike the traditional history of science and its tales of the hero, he invokes legendary heroes. Their names designate crystallizations of styles. They are half mythical and half historical icons. Materiality and myth come together in the beginnings of laboratory science,

> here is my myth, the air-pump marks the beginning of a form of life, the beginning of the academies of science, the beginning of the space we call the laboratory, populated by technical devices that are the true inhabitants of the laboratory and the beginning of the style of thinking I call laboratory style. (Hacking 2006, 16)

Thus, this device is presented as the metonymy of a process that links different types of agents, objects, measuring devices and instruments, philosophers, the scientific public, the way of writing scientific prose, animals and marbles, the laboratory where manipulation and intervention practices are developed and where phenomena are manufactured. Hacking follows the short life of the air-pump. At first, the results obtained were controversial. After a few years, the pump stabilized, something which required significant investment in research and development. It reached maturity in 1678, twenty-one years after its creation. Later, it died of obsolescence and irrelevance (Hacking 2006, 11).

The birth of the air-pump is closely linked to the production of a new phenomenon, the vacuum. The pump can almost completely suck out the air which it has inside. If the air is removed from the pump, the dog inside weakens and dies. Although nature abhors vacuum, this device can produce it.

However, even at the best of times, the pump did not work as expected. The pump's vacuum was unstable. The competition between Boyle's apparatus and that of Huygens in connection with filtrations and calibrations leads Hacking to a new stage in the analysis of the continence-permanence dynamic.

Two serious difficulties arose for the air-pump: "A thin disc of very smooth marble will stick to another; Boyle expected the bottom one to fall off in a vacuum, and it did not. Likewise, there was the problem of the anomalous suspension of water" (Hacking 1991, 237). In solving the last difficulty, a way of "working" came into play for air-pump technology that would become over time the typical way of working in laboratory science, self-vindication.

The theories of laboratory science are not compared to "the world" but persist because they are true with respect to the phenomena created in the laboratory by the devices and measured by the instruments we design. Laboratory science stabilizes when theories and equipment evolve in such a way that they adjust to each other. This symbiosis is a contingent fact about people, our scientific organizations, and nature. Thus, both the

symbiosis of the social and the natural and the stability of laboratory science are processes involved in contingency (Hacking 1992). But at the same time its self-vindication is part of the self-authentication of the laboratory style of reasoning, in an evolution that, according to Hacking (1991; 1992), leads it to autonomy from any social order.

The story of the life of the air-pump, of its invention, the controversies surrounding it, its technical problems, its triumph, its obsolescence and its irrelevance, is at the same time the story of the material circumstances in which a new style of scientific thinking and doing crystallizes. Hacking is interested in analyzing the contingencies of the new laboratory: "There is no single story to tell about the disparate Braudelian entities" (Hacking 1992). Hence, the importance of telling the story which describes the emergence of styles of reasoning in its specificity.

The origin of the laboratory style is evanescent. It is produced by the design of a device, the air-pump, and the creation of a phenomenon that did not previously exist in the universe. A new kind of science responded to the phenomena that fleetingly exist as a result of artifice.

But a new place is also configured to create phenomena. The laboratory emerges. Its site and architecture are spatial inscriptions of science, enabling and constraining scientific practices. In close relation to the practices of self-vindication that begin to develop in the laboratory, a new kind of truth-telling is also created, reporting credibly about the phenomena that were produced and witnessed.

One more element makes up the contingencies of this origin. The crystallization of laboratory science is cut through by the vicissitudes of the controversy between Hobbes and Boyle. This debate literally revolved around the convenience of adopting the laboratory style of reasoning. It is the story of Hobbes fighting in vain against Boyle's new laboratory. Hobbes feared created phenomena. He argued that there were already enough phenomena in everyday life, in the life of explorers, in the life of doctors, in the life of astronomers. So he believed that another life, the life of the laboratory, was not necessary.

Hobbes calls into question the authority of the laboratory itself. His questioning is rooted in the tension between the rhetoric of public testimony of the experiments and the private nature of membership of the Royal Society of London, the unavoidable point of access for those who wished to participate in the experiments.

Hobbes, with his rejection of the laboratory, the practices that developed within it and the exclusions they engendered, constitutes for Hacking the only witness who saw exactly what Boyle was doing. Hobbes predicted that the laboratory apparatus for generating phenomena was radically new. In the laboratory, one could create by artifice what could not be done in nature.

Hacking sees in the dispute between Hobbes and Boyle over the authority and trustworthiness of testimony the close relationship between the emergence of a style of thinking and the development of a social institution. There is nothing that makes the emergence of a style of reasoning necessary. Despite this, its emergence is inseparable from the institutions that develop it. Styles are enabled by institutions (Hacking 1992a; Martínez Rodríguez 2021). It was for this reason that Hobbes had to destroy the institutional basis of the laboratory style of thinking if he wanted to criticize it (Hacking 2009, 28).

However, once a style matures, it becomes autonomous from the local and social contingencies that gave rise to it. Hacking maintains that styles culminate as modes of objectivity about a broad class of facts, endowed with their own authority and usable as neutral tools for various projects. There is no single story to tell about each style. However, for Hacking, it is not possible to make a history that combines the social order with the order of knowledge around laboratory science because "there is no longer any particular social order that befits that laboratory science" (Hacking 1991,240).

> The new style was made legitimate in a conjuncture of crisis. It was an admirable fit to certain exigencies of the day. But it has proved extraordinarily resilient to – and

> indifferent to – a great many different forms of social organization. Origins, attractive as they are, don't yet teach us much about the autonomy of styles of reasoning – except for this critical lesson, that they do have evanescent origins. They only *become a priori* (Hacking 1991, 241).

Hacking's story of the material conditions of the emergence of the laboratory style explores the discordant harmony of things. It is a story of contingencies at a moment of crystallization, but also of the contingencies that enter into dialogue with permanence in the long process of the continuation, expansion and revitalization of styles, even of the contingencies that lead a style of thinking to become a historical a priori.

Cartesian Anxiety

The historiographies of Shapin, Schaffer and Hacking constitute serious attempts to put aside the dichotomies implicit in Cartesian anxiety. This anxiety is the modern journey of the soul seeking the Archimedean point for the resolution of metaphysical and epistemological problems. It assumes a big "Either/Or" with capital letters, either there are solid foundations, fixed constraints that ensure our knowledge and can serve as a guide for our lives, or we face a relativistic abyss in which nothing is stable, and anything goes (Bernstein 1983). Going beyond Cartesian anxiety entails, for Bernstein, the obligation to find new ways of thinking and conceiving new concepts.

This task confronts us, as Richard Rorty (1991) states, with the duty of probing abysses that most people agree do not exist. The absence of meaning is exactly what one has to flirt with when one is situated in the midst of social and linguistic practices, not wanting to take part in the old ones but not yet having managed to create new ones. The perplexity of these situations commits us to collective knowledge and action. Receptions, appropriations, citations and unforeseen uses are some of the ways in which we think with others, without the need to establish consensus. It matters what subjects we use in order to think about other subjects; it matters what stories we tell in order to tell other stories; it matters what knots tie knots, what thoughts think thoughts, what descriptions describe descriptions, and what ties link ties. It matters which stories create worlds, which worlds create stories (Haraway 2016).

The historiographic rewritings of Shapin, Schaffer and Hacking aim to go beyond essentialisms and foundationalisms in the analysis of scientific practice and in the reflection on historical and philosophical production itself. They are interpretations sensitive to unexpected contingencies and genuine novelties found in particular situations.

In the introduction to the second edition of *Leviathan and the Air-Pump* in 2011, Shapin and Schaffer rethink their book as a product of its time and, in that sense, as a historical document of a moment in changing scholarly traditions, changing conventions, problems, and purposes. The authors understand their task as making performative acts of intervention in the present that seek to question the meaning of the past. *Leviathan and the Air-Pump* bursts forth showing the artifactuality of historiographical representations. Its intervention in the present makes evident the responsibility that comes with history-making, "As we come to recognize the conventional and artifactual status of our forms of knowing, we put ourselves in a position to realize that it is ourselves and not reality that is responsible for what we know. Knowledge, as much as the state, is the product of human actions" (Shapin and Schaffer 2011, 344).

As I pointed out at the beginning, these shifts implied a philosophical commitment to a finitist semantics formulated by the Strong Program of the sociology of scientific knowledge. To the extent that "[t]here are no grounds for asserting that where a culture employs, over a period of time, a specific written sign or a specific noise, there is an

associated fixed meaning or 'unit idea'" (Barnes 1982, 36), finitism opens the way for historians of science towards the investigation of the scientific practice of the past in its situated particularities. Finitist historiography breaks with historiographic traditions that essentialized science, that understood scientific ideas isolated from their context of use, that endowed such ideas with intrinsic agency, and that celebrated and defended the past of science to the extent that it presaged modernity.

Finitism is the anchoring point from which Shapin and Schaffer's historiographic proposal seeks to move beyond Cartesian anxiety. It frees historiography from setting pre-research limits on what is considered relevant to understanding the science of the past. It opens the way to contingency; it makes it possible to think about plurality.

If, in accordance with finitism, scientific practices are analyzed as Wittgensteinian language games and forms of life, the development of language games is not determined by past linguistic and non-linguistic practices. Language games occur immersed in forms of life, and life (practices) take shape only in the given language games (Cabanchick 2010). However, finitism faces a problem, how to explain the collective preference in favor of one application strategy over another. The choice invariably corresponds to its relevance to the purposes and interests of the agents. This solution postulates the constitutive nature of interests and purposes in the processes of the generation, extension and stabilization of knowledge (Barnes 1987).

In this sense, *Leviathan and the Air-Pump* focuses on the joint production of the social order and the epistemic order through language games and the form of life of experimental philosophy. The finitist perspective allows Shapin and Schaffer to put on display the ways in which the diversity of relevant aspects is multiplied in the configuration of the experimental form of life. Shapin and Shaffer's historiographic narrative tells stories about science as a practice "produced by people with bodies, situated in time, space, culture, and society, and struggling for credibility and authority" (Shapin 2010).

I am now going to delve into the notion of form of life. I consider that it constitutes the focal point from which we can understand the rewriting of the Hackinean history of experimental philosophy. At different times, Hacking problematizes Shapin and Schaffer's use of the expression "form of life". However, his comments and arguments regarding this notion are not always critical. His vision takes on different nuances.

In "Artificial phenomena", an essay review of *Leviathan and Air-Pump*, Hacking notices that,

> Wittgenstein's phrase 'form of life' runs through the book. He certainly used 'form of life' when expressing the thought that some things are beyond or behind justification. But I would be more cautious than the authors in invoking it here (…). At any rate' form of life' sounds, to me, far too solemn, generalized, and all embracing a term for what Boyle urged and Hobbes forfended. (Hacking 1991, 240)

Although he does not clarify what is meant by "form of life", he questions the meaning that the authors give to expressions such as "accept a form of life" or "reject it". The idea of a form of life refers to social activities, but these are not consciously chosen (Hacking 2006).

In "Statistical Language, Statistical Truth and Statistical Reason", Hacking points out that it is becoming common to historicize Wittgenstein and consider forms of life as historical entities. In that context, he evaluates the relevance of considering this notion as a historiographic meta-concept, along with others such as Kuhn's paradigm or Fleck's *Denkstill*. He argues that, although language games and forms of life enable and limit practices, as in the other cases, it is difficult to believe "that from within the text of Wittgenstein himself we will find much support for the idea of competing language games" (Hacking 1992a, 139).

In *Scientific Reason* (2009), he clearly rejects the option of analyzing the notion of form of life as a historiographical analytical category. Hacking endorses, although with reservations, the application of this expression to the analysis of scientific practice: "I am too cautious a reader of Wittgenstein to follow our two authors in using his words but is a valuable direction to contemplate (…) Some, like Schaffer and Shapin, use the phrase with precision. Most do not" (Hacking 2009, 105-106).

Again, Hacking highlights Shapin and Schaffer's use of "form of life" in relation to the social order. The main idea of these authors, he clarifies, is that Boyle's laboratory and his contemporaries mark the invention of a new social order. However, the Hackinean characterization is separated from the interpretation given by the sociology of scientific knowledge. A form of life is an almost Kantian notion, the idea of a framework for any experience (Hacking 2006, 13).

Finally, he tries to reformulate his vision of the experimental philosophy of the seventeenth century in terms of language game and form of life: "If I were to choose to use Wittgenstein's words for my own purposes, I would suggest that the crystallization of the laboratory style of scientific thinking deployed a new language game, within a novel form of life" (Hacking 2009, 106).

Although the notion of a form of life seems to have affinities with Hacking's work, in some aspects, it does not fit with his "styles project".

Hackinean history, as I pointed out in the previous section, seeks to move outside the dichotomies implicit in Cartesian anxiety, comprehending the stability of "Braudelian entities" immersed in continuous contingencies. The discordant harmony of things is the figure that governs the affinities and differences between Hackinean philosophy and the social studies of science. This is how Hacking recognizes it in relation to laboratory science:

> They hold that scientific facts are real enough once the making has been done, but that scientific reality is not "retroactive". My investigation of stability is precisely an investigation of that kind of product from a different vantage point. I am moved to the investigation by a curiosity about the death that follows laboratory life, about the cumulative inaction that follows science in action. (Hacking 1992, 52)

Death following life and inaction following action are other figures of discontinuous crystallization and continuous evolution. However, this dynamic is expressed so far only in the epistemic-metaphysical order.

When a style crystallizes, all the social dimensions are in view: "If you want interests, we have interests. If you want rhetorical devices, we have those. And institutions, modes of legitimation, takeover battles, constructions, uses of power, networks, intimations of control, and much, much more" (Hacking 1992a, 133). Conversely, once the style stabilizes and matures, the relevance of the contingent decreases and there is no longer any social order that befits the style of laboratory science. In defense of the autonomy of the styles of scientific thinking and doing, Hacking carries out a shift in the relationship between the order of knowledge and the social order. In this sense, the idea of form of life and its inalienably normative character is left out. His interest is in the creation of phenomena and in the material-epistemic processes of self-vindication and self-authentication. The laboratory style becomes a condition of possibility, a historical a priori.

This movement clarifies why Hacking's rewriting of the history of experimental philosophy has the air-pump as its main character and why the laboratory, a privileged place in his narrative, is inhabited "only" by devices and instruments.

However, styles of scientific reasoning exist naturally and culturally. Hacking points out that:

> style of thinking begins with the discovery of how innate capacities can be used in new ways to find out about something. That is what has traditionally been called part of the

> "internal" history of science. But what maintains some way of finding out must be its use in a cultural context. That is part of an "external" history. The self-authentication is internal, the perseverance, external. (Hacking 2009, 47)

Here, the notion of form of life comes into play. The social institutions that always accompany the development of a style of scientific thinking and doing reveal the social order. However, this inclusion has consequences. The appropriation of the idea of form of life, as used by Shapin and Schaffer, introduces an intimate commitment to finitism. According to the sociology of scientific knowledge, institutions "do not and cannot exist independently, or in advance of, the acts of reference which constitute them" (Bloor 1996, 851). Every social institution refers to something created collectively through self-referential practices. Social institutions are governed by the logic of finitism. Hacking does not define social institution but, by accepting that the notion of form of life brings with it the social bases necessary to stabilize the laboratory style, it becomes impossible to separate the social order, the natural order and the epistemic order.

The introduction of the categories internal and external seems to hinder understanding rather than clarify the processual nature of the discordant harmony between styles of reasoning, the metaphysical dimension of the creation of objects and social dynamics. In the seventies, precisely, the social studies of science concentrated their efforts on transcending the historiographic internalism-externalism debate and the set of dichotomies that accompanied it. Within the framework of this debate, scientific practices became incomprehensible. Hacking is fully aware of this. He refers to the expressions "internal" and "external" as "those tired words", although he finds them useful to point out the role that self-authentication and social context play in his work (Hacking 1992, 49). His historiographical analysis tends to be from the internal side of the dichotomy.

As I pointed out at the start of this section, it matters what thoughts think thoughts. Hacking thinks of philosophy as taking a look at the rich complexity of the world, "It is not philosophy as conversation. It is philosophy as hard work. Or to use an understatement, it is less talking than taking a look" (Hacking 2002, 71). However, his philosophy entails also thinking with others, which explicitly seeks to dissolve disciplinary dichotomies. This is the case with the contrast between analytical philosophy and continental philosophy (Martínez Rodríguez 2021). It is the same with the close connection with the social studies of science, at a time when the realism/anti-realism debate made unthinkable a fruitful relationship. The following will suffice as examples, the expression with which Hacking closes the review of David Bloor's book, "I find myself regularly defending Bloor's programmes when I am in the company of philosophers who denigrate them" (Hacking 1984, 476) and the humorous recognition that he is part of a broader set of scientific studies that aimed to plumb abysses that most people agree do not exist:

> I saw myself as starting a "Back to Francis Bacon movement", little knowing that it was well under way. Latour and Woolgar had already published their ethnography of the laboratory, and Shapin and Schaffer were completing *Leviathan and the Air Pump.* Next year Peter Galison was to publish *How Experiments End*. (Hacking 2009, 109)

Conclusion

In this article, I have analyzed the philosophical commitments and historiographical narratives of Shapin, Schaffer, and Hacking. I interpret Hacking's appropriation of *Leviathan and the Air Pump* as a rewriting of the history of seventeenth-century English experimental philosophy. The decision to frame my analysis of these historiographies as attempts to dissolve the dichotomies underlying Cartesian anxiety focuses on the objective of examining

the meaning of Hacking's claim that Shapin and Schaffer's book constituted a source for his historical philosophy. The notion of source, which comes at a high price in the vocabulary of history, does not seem to account for the complex relationship that was interwoven in this process of reception of that historical work. The works of Hacking, Shapin and Schaffer dispute the ways of representing the past, but also the realistic character of these representations. In this sense, I consider the rewriting of the past as the renewed promise to better represent the past rather than as the best representation of the past as it was.

In the case of Shapin and Shaffer, the mundane history of science, which is rooted in the finitist perspective, accepts the contingency of knowledge-making. The stories make their own artifactuality visible and accept that writing is the result of inevitable renegotiations with others of the meaning of reality.

Through the "styles project", Hacking's historical philosophy seeks to account for the contingency of stability. This oxymoron guides Hacking's thinking. He does not intend to combine contingencies with stability, nor to dilute contingency once stability is achieved. Hacking's paradoxical story aims to combine natural order, social order and epistemic order. His representation of the history of science points in the direction of materiality, material practices, devices, objects and instruments. But it encounters a limitation. He cannot resolve the joint production of social order, natural order and knowledge order in terms of discordant harmony. The dichotomy of the internal-external once again produces Cartesian anxiety.

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