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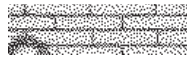

The 1960s in France

A tradition of historical epistemology was already established in France in the 1930s, with the work of Gaston Bachelard, along with that of historian of chemistry Hélène Metzger and historian of mathematics Jean Cavaillès. After the war, this tradition was continued first of all by Bachelard himself, with a second series of epistemological texts. Bachelard's successor in the chair of history and philosophy of the sciences at the Sorbonne was the historian of biology and medicine Georges Canguilhem, who in turn had an influence that must not be underestimated on the group of French philosophers and historians prominent in the Paris debates around structuralism and poststructuralism in the 1960s. These included, among others, Michel Foucault, Louis Althusser, and Jacques Derrida. This chapter will examine some of their positions, insofar as they relate to basic questions of the history concerning science.

Canguilhem, who had studied not only philosophy but also medicine, focused on the history of medicine and the life sciences, whereas Bachelard had come to the history of science from physics, chemistry, and mathematics. If Bachelard had made a major contribution to historicizing the philosophy of science of his time, Canguilhem proceeded conversely from the history of science, and was concerned to give it an epistemological foundation with a focus on the history of scientific concepts. "This history," he wrote in an essay on the history of science in Bachelard's epistemological work, "can no longer be a collection of biographies, nor a tabulation of doctrines after the manner of a natural history. It must be

a history of conceptual filiations. But this filiation possesses a discontinuity, just like Mendelian inheritance. The history of science must be as equally demanding, and as equally critical, as science itself."[1] Canguilhem represented a form of conceptual history that can also be understood as a history of the displacement of problems which must be reconstructed in their historic context.

Why history of science, and what for? For Canguilhem, the essential philosophical reason for taking the history of the sciences seriously was grounded in the fact that "a theory of knowledge with no reference to epistemology would be a meditation in the void, while epistemology with no reference to the history of the sciences would be a completely superfluous duplication of the science about which it pretends to have something to say."[2] If one really wants to know how scientific research functions, one has to look at the sciences in detail. This is best done, in the view of Canguilhem, following his Dutch colleague Eduard Dijksterhuis, by seeing the history of the sciences as itself an "epistemological laboratory." This is where the above-cited passage on the necessity of a history of science that is pursued as critically as the sciences themselves takes its precise meaning. An experimental epistemology sees "the relationship between the history of the sciences and the sciences whose history it is as just like . . . the relationship of the sciences to the objects whose sciences they are."[3] It is the task of the history of science to constitute a historical object sui generis, and to develop it further in constant debate and interaction with the historical material.

But how is this object to be grasped and understood in more detail? Canguilhem decidedly distances himself from two opposite positions that were put forward in the contemporary debate over the history of ideas: so-called externalism and internalism. Staunch externalists saw the history of the sciences as a derivative phenomenon, the explanation of which required reference to social and economic interests, and the technologies and ideologies that were bound up with them—interests that exhaustively determined science. The internalists, on the other hand, set themselves to what Canguilhem called a "completely superfluous duplication" of the sciences, simply following their course reflectively once more with the sciences' own conceptual resources. Both of these positions, which are counterposed here in a simplified version, thus fell short of reflection on the specificity of their object. The externalists, upon close inspection, lacked a special object

called "science" to which a life of its own could be ascribed, while the internalists did not succeed in differentiating their own object from the objects of the science that they investigated.

Canguilhem separated three levels of objects. First, there is the natural object "outside of any discourse held about it." It functions vis-à-vis the possible scientific discourses like a kind of "pre-text." But it is not properly the object of the sciences, for this object constitutes a second level. "Nature is not in itself divided into scientific objects and phenomena. Science rather constitutes its object from the moment that it finds a method for building a theory from coherent propositions, which in turn is controlled by the concern to make out its flaws."[4] We are reminded here of Bachelard's dictum that the structure of scientific thought is "the awareness of its historical errors." The sciences submit their object to permanent change, yet they do not conceive of its essence as a historical one. On this second level, therefore, we still have not reached the object of the history of science, as this is once more sharply distinguished from the object of science itself. History of science has to identify and analyze the conditions under which the "secondary, nonnatural, cultural objects" of the sciences are being formed. The object of the history of science is therefore the particular "historicity of scientific discourse, insofar as it expresses a procedure that is normalized from within, but is punctuated by accidents, impeded or thwarted by obstructions, and interrupted by crises, that is, moments of judgment or truth."[5] The objects of the sciences are not treated as historical by the sciences themselves, yet from the perspective of the history of science the character of a historical process is inscribed into their very core.

The history of science thus constitutes a "specific domain in which the theoretical questions thrown up by scientific practice in its development find their place."[6] It was clear to Canguilhem that this domain was not a homogeneous space. On the one hand it was multiply partitioned, and the history that these particular partitions underwent was not reducible to a single homogeneous time. "The time of arrival of scientific truth, however, the time of veri-fication, has a different fluidity or viscosity for different disciplines in the same periods of general history."[7] On the other hand, the domain of history of science was not limited to scientific discourse in the narrower sense. Historians of science, in the context of their reconstructions, have to deal with science together with "nonscience, with ideology, and with political and social practice."[8] For the objects of the

sciences are themselves the product of a cultural activity, and while their existence certainly maintains reference to the natural objects of the first order, they do not coincide with them.

The objects of knowledge are reflected in concepts, and by way of their changing meaning the historian is able to reconstruct trajectories. According to Canguilhem, it is only this last task that gives the history of science the rank of an activity that can itself make a claim to science, raising it above a mere inventory, the simple "natural history of a cultural object."[9] Canguilhem devoted his own work in the history of science to a conceptual history of this kind—from the concepts of the normal and the pathological in his medical dissertation; via the concept of reflex in the seventeenth and eighteenth centuries in his philosophical dissertation; to the biological concepts of the cell, the internal environment, and organic regulation, among others, in his later writings.

According to Canguilhem, historians must be aware of the fact that in their work they are constructing a temporal order of their own. One of the main problems that he raises in this context is the question of continuity and break in the development of the sciences. Here Canguilhem takes a cautious distance from Bachelard, at least as far as Bachelard's assumption of a radical break between everyday experience and scientific experiment is concerned. For Canguilhem, this transition is a smoother one. The sciences, moreover, as cultural formations of a particular kind, "breathe" as it were with a varying frequency, the dynamic of their conceptual replacement and transformation being sometimes slower and sometimes faster. But Canguilhem does not follow Kuhn's characterization of the structure of scientific revolutions either, at least not in the social and psychological dimension that Kuhn ascribes to the revolutionary gestalt switch.

Canguilhem seeks to make clear his own position with respect to the figure of the "precursor" in the history of science. For him, the precursor is the example of a "false historical object."[10] Both the precursor and the search for precursors are the result of a confusion between the object of science and the object of the history of science. "Strictly speaking," writes Canguilhem, "the history of science would lose all its meaning if there were precursors, since science would then only seemingly have a historical dimension."[11] The precursor is "not the agent of scientific progress," not an innovator *avant la lettre*, but rather a historiographic misconstruct.[12] Even in its faulty guise, however, it refers to the fact that a certain knowl-

edge can in retrospect find a place that it did not have on its first appearance. With the notion of historical recurrence, Canguilhem (here closely following Bachelard) sought to develop the conception of something like a dialectical unity of continuity and change in the development of scientific knowledge, and to explain with examples such as the development of cell theory or the doctrine of biological inheritance how the objects of knowledge are historically constituted.

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With Michel Foucault's archaeology of knowledge, French reflection on the historiography of science reached a new stage. Foucault had studied psychology and philosophy—his teachers included Louis Althusser, Jean Hyppolite, and Maurice Merleau-Ponty; in the early 1950s he was also much concerned with Heidegger, and first made his mark in the history of science with two major works on the history of psychology and medicine, *The History of Madness* and *The Birth of the Clinic*. Both books focused on the boundary between the natural and the human sciences. But it was only with *The Order of Things* in 1966 that Foucault attracted continuing attention beyond the French borders. In this "archaeology of the human sciences," he developed—with reference to economics, linguistics, and natural history of the eighteenth and nineteenth centuries—the concepts of "discourse formation" and "dispositive," which in *The Archaeology of Knowledge*, published in 1969, he then made into the object of a detailed historiographic reflection. Here Foucault claimed programmatically: "I cannot be satisfied until I have cut myself off from 'the history of ideas,' until I have shown in what way archaeological analysis differs from the descriptions of 'the history of ideas.'"[13] The traditional history of ideas, which Foucault set out to challenge, stood in his formulation under the three fatal stars of "genesis, continuity, totalization."[14] How an "archaeology" of knowledge undermines this triad is something we must examine more closely; for Foucault, as he never grew tired of stressing, it was above all a method of analysis "purged of all anthropologism."[15]

Foucault explicitly linked up here with the studies of Bachelard and Canguilhem, who had shown him that what characterized the history of the sciences was not homogeneity and continuity, but rather dispersion and breaks. He saw the underlying change that this meant in the form and

manner in which history was seen as having come into being with Karl Marx in the later nineteenth century. For Foucault, this change was still far from complete, or at least not yet consistently taken up as the subject of reflection in the field of the history of knowledge—in contrast for instance with linguistics, psychoanalysis, and ethnology. "It is as if it was particularly difficult, in the history in which men retrace their own ideas and their own knowledge, to formulate a general theory of discontinuity, of series, of limits, unities, specific orders, and differentiated autonomies and dependences."[16] Genesis (with its other face of teleology), continuity, and totality were characteristic of a history conceived under the "founding function of the subject." It is against this triple conjuration of the subject that Foucault's effort was directed to put a stop to being afraid of the noise and proliferation of discourse, the "powerful anonymous murmuring of that discourse revolving on its own axis,"[17] and to conceive difference, decentration, the abandonment of coherence, in short "to conceive of the *Other* in the time of our own thought."[18]

There are four principles that distinguish an archaeology of knowledge from the traditional history of ideas. First and foremost, there is the unit of analysis, which is discourse. "Archaeology tries to define not the thoughts, representations, images, themes, preoccupations that are concealed or revealed in discourses; but those discourses themselves, those discourses as practices obeying certain rules."[19] It is, then, not a matter of ideal objects, or ideas, that could be peeled off from practiced discourses and their historical remnants in the sense of an appropriation of sources, but rather of the discursive conditions of possibility for producing certain things in speech and practice. It is a question of spontaneous or organized forms of "rémanence,"[20] models of persistence that do not present to the archaeologist more or less transparent documents for a decipherable ideality, but rather monuments whose own materiality and forms of resistance need to be addressed and understood.

Second, Foucault's archaeology sets its sights less on transitional zones than on what is typical of the strata in question. It "does not seek to rediscover the continuous, insensible transition that relates discourses, on a gentle slope, to what precedes them, surrounds them, or follows them." Rather it is interested in showing "in what way the set of rules that they put into operation is irreducible to any other."[21] Foucault is prepared to give this concentration on a "positivity" the title of structural analysis, but

not as a way of counterposing it to historical analysis. The question for him is rather to undermine the traditional opposition of structure and genesis, and to turn this as it were on its head: history *is* structure.

Third, this archaeology's ordering principle and criterion of classification is not the finished work of a sovereign author. "The authority of the creative subject, as the *raison d'être* of an *oeuvre* and the principle of its unity, is quite alien to it." Foucault's archaeology rather defines "types of rules for discursive practices that run through individual *oeuvres*."[22] Such "running through" is to be taken quite literally here, as in seeking to track down rules of discourse Foucault is not setting out to define a new form of totality. What he is looking for is rather something like conditions of possibility that in the monuments take different material shape but can only be disclosed by incursion.

Fourth and last, "archaeology does not try to restore what has been thought, wished, aimed at, experienced, desired by men in the very moment at which they expressed it in discourse." It does not set out to uncover an original meaning that may have been buried in the course of time. It is not reducible to the authenticity of what is brought to speak. Rather it sees itself as "nothing more than a rewriting." It is, in other words, a construction and not an interpretation or a hermeneutics. If it brings something to light, it is a "discourse-object."[23]

In an archaeology of knowledge such as Foucault strove for, the focus of interest is not on a history of scientific disciplines. The use of the word *knowledge* in the title of his book was carefully chosen by Foucault. Discursive formations may include disciplines, but they need not in every case crystallize into disciplinary specialties. In his *Archaeology of Knowledge*, Foucault defined four thresholds for the formation of knowledge in the space of the discursive: the thresholds of positivity, of epistemologization, of scientificity, and of formalization. The threshold of positivity involves the separating off and staking out of a discursive field, which assumes a tendency to autonomy. Epistemologization applies within a discursive formation characterized by a particular positivity, for example through norms of coherence. Beyond the threshold of scientificity, statements within a formation must obey particular laws of construction. The threshold to formalization is finally crossed when the corresponding knowledge formation has made the transition to conceiving itself in terms of axiomatic assumptions.

Foucault's characterizations are somewhat unspecific in their formulation, but they are interesting from a historiographic point of view, as they enable him to associate previous approaches to the history of science, including his own, with a privileged gaze at particular thresholds. Traditional history of science, with its orientation to mathematical physics, preferred to operate above the threshold of formalization, and thus remained fixed on the narrow window of its very specific type of discourse, which it also marked out as normative. With the historical epistemology of Bachelard and Canguilhem, history of science was conducted at the threshold defined by scientificity. Bachelard's definition of the "epistemological break" between everyday knowledge and scientific knowledge pointed precisely to this threshold, according to Foucault. The archaeology of knowledge in turn directs its attention to the two thresholds of positivity and epistemologization. This is why Foucault describes it as an "analysis of the *episteme*."[24] It is the task of a future archaeology of discursive formations, conducted in the perspective of an emergence of epistemological figurations, including the sciences, to determine the mutual interrelations between these thresholds, which moreover in no way need to be crossed in the given sequence, and accordingly do not present a series of stages: "The distribution in time of these different thresholds, their succession, their possible coincidence (or lack of it), the way in which they may govern one another, or become implicated with one another, the conditions in which, in turn, they are established, constitute for archaeology one of its major domains of exploration."[25] It does not subsume knowledge under a theory of knowledge, but relates it to the "processes of a historical practice."[26]

What is decisive for archaeology of knowledge is that, as Foucault contends, it follows a "discursive practice/knowledge (*savoir*)/science axis," in contrast to traditional history of ideas, which moves along the "consciousness/knowledge (*connaissance*)/science axis." From this it follows that archaeology finds its point of reference, not in the *connaissance* of a subject, but in the *savoir* that is related to the structure of a practice, and in relation to which the subject in question does not appear as "titular," but essentially just as a temporary participant.[27] The archaeology of knowledge has recourse to deep structures, historically located rules of production which give an episteme its form, without being visible and transparent as such. With Foucault we are thus also dealing with a historical a priori, but one of a quite different form than that which we have seen with Husserl.

Foucault did not maintain, as is sometimes claimed, the disappearance of history and historicity altogether, but rather the evaporation of "that form of history that was secretly, but entirely related to the synthetic activity of the subject."[28] The history of ideas is itself a form of discourse, and Foucault inveighed against its "ponderous, awesome materiality" in *The Discourse on Language*,[29] his inaugural lecture at the Collège de France, which he gave a short time after publishing *The Archaeology of Knowledge*. He aimed at replacing it by a form of presentation that oriented itself on the structural sciences, whose object is not consciousness but rather ensembles of practices, such as economics, forms of communication, institutions, or rituals.

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With that, to a certain extent, Foucault linked up with one of his mentors, Louis Althusser, even though the latter did not concern himself with history of science in any strict sense. Althusser arrived in France from Algeria before the war. He studied philosophy at the École Normale Supérieure, where he assumed a teaching post in 1948, after having spent the greater part of the war in a German labor camp. Althusser's reading of Marx, directed against both humanistic and orthodox interpretations, started out from the thesis that Marx had opened up a new continent of science with historical materialism, the continent of history. Althusser followed Marx in seeing the driving moment of history as the changing relationship between forces and relations of production, and hence saw its basic structure as a "process without a subject." In a late reflection on this initial position, he replied in an interview: "This is the negation of all teleology, whether rational, moral, political, or esthetic. I would add that this materialism is the materialism, not of a subject (whether God or the proletariat), but of a process—without a subject—which dominates the order of its development, with no assignable end."[30] This materialism can ultimately be defined only as an "aleatory" one, without which history cannot be conceived as "living history" in the sense of an "openness of the world to the event."[31] Althusser's interpretation of Marx could also be described as a structuralism of contingency.

Analogously, Althusser sought to conceive of scientific knowledge as an inconcludable process of production. As distinct from material produc-

tion, however, while scientific work proceeds from a "real object," its products take the form of "objects of knowledge." Its practice is founded in the materiality of an experimental dispositive, the results of which, however, in their difference, as "thought-things" (*Gedankenkonkreta*, in Marx's expression), permanently need to be reported back to the real object. In his inaugural lecture, Althusser summarized this movement as follows: "This is the unending cycle of any knowledge, which only adds *its* knowledge to the real in order to render it back, and this cycle is only a cycle and consequently a living one, *if it reproduces itself*, for only the production of new knowledges keeps the old ones alive."[32] "Proof and test" are not externally applied standards, but rather "the product of definite and specific, material and theoretical dispositions and procedures, which are particular to each science."[33] There are thus two themes in Althusser's writings that Foucault took up, giving them his own stamp. First of all, the theme of a radical critique of the subject in the sense of a theoretical antihumanism, serving as the basis for an aleatory understanding of history; and second, the attempt to approach theory, including the sciences, from the standpoint of specific practices, and not in the form of concepts only.

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The final writer to consider in this context is Jacques Derrida. It is well known that the natural sciences and their history play no role in his work—neither did they have a prominent place in Foucault's writings. Yet Derrida's work is intimately related to historical epistemology. Born like Althusser in Algeria, Derrida arrived in France in 1952, studying philosophy at the École Normale Supérieure and attending the seminars of Althusser and the young Foucault. In a talk from the late 1990s, Derrida had this to say about the time at which he was studying: "In the early 1950s, after phenomenology was introduced to France by Sartre and Merleau-Ponty, I saw the need to pose the question of science and epistemology, which neither Sartre nor Merleau-Ponty had done. And so I wrote my first essays on Husserl. These revolved around the questions of scientific objectivity and mathematics: Cavaillès, Tran Duc Thao, as well as the question of Marxism."[34]

It is the late Husserl, in fact—to whose phenomenological analyses both Sartre and Merleau-Ponty also referred—that best enables us to understand the path taken by Derrida. As we have seen, Husserl had opened

up the space for an epistemology which posited itself in a historical perspective in a specific way. Derrida described it as follows: "In order to peel away this skin from the phenomenon, and differentiate it both from the reality of the thing and from the psychological texture of my own experience, an extraordinarily subtle operation was needed. It required recourse to the wilds of meaning, a particular sensibility in the conversion of the gaze."[35] In engaging with Husserl, Derrida located himself in the French tradition, situated between positivism and psychologism, that led from Bachelard, via Cavaillès and Canguilhem, to Foucault. It must not be forgotten that from 1960 to 1964, Derrida was assistant to Canguilhem at the Sorbonne.

The question is, to put it in Cavaillès' terms, how the movement of a "permanent revision of contents by deepening and extinction" can be appropriately conceived,[36] characterizing as it does the developmental process of the sciences, a process that takes place "in the wilds of meaning" and that is yet not devoid of rigor or rule. Proceeding from Husserl's remarks about the origin of geometry, Derrida hopes, as he notes, that on the one hand this effort "brings to light a new type or new profundity of historicity; on the other hand, and correlatively, it determines the new tools and original direction of historic reflection."[37] Derrida agrees with Husserl that "the historicity of ideal objectivities" of mathematics, "i.e. their *origin* and *tradition* (in the ambiguous sense of this word which includes both the movement of transmission and the perdurance of heritage)," obeys "different rules, which are neither the factual interconnections of empirical history, nor an ideal and ahistoric adding-on."[38] And at another place in *Edmund Husserl's "Origin of Geometry"* he adds: "If we take for granted the philosophical nonsense of a purely empirical history and the impotence of an ahistorical rationalism, then we realize the seriousness of what is at stake."[39]

The *Rückfrage*, as Derrida calls it after Husserl, is "the pure form of every historical experience."[40] It is this query that endows with meaning an event that would not otherwise be able to make its appearance and that as such would neither be accessible to a primary determination nor in a position to induce a discourse. As we have seen, however, Husserl's *Rückfrage* remained embedded in what he conceived as a "teleology of reason" under universal signs. Proceeding from Husserl, Derrida undertook the attempt to, as it were, turn the tables and transform the *Rückfrage* into a nonteleological form of iteration.

Husserl's *Origin of Geometry* contains just one short paragraph indicating the historical intervention of writing and its significance for the development of the sciences: "The importance of written, documenting linguistic expression is that it makes communications possible without immediate or mediate personal address; it is, so to speak, communication become virtual."[41] Derrida has stressed this indication of Husserl's, basing himself on it to develop a more exoterically oriented epistemology of the historical, one that operates in the space of "virtual communication" and that ascribes the sciences a place in a typology of forms of iteration. What this then involves is a knowledge of the *procedures* of obtaining knowledge. The space of phenomena and events that Derrida outlines and maintains—between the "reality of the thing" and the "psychological texture of experience"—thus becomes a place in which the *means* involved in the production of knowledge come into view. Parallel with Foucault's analysis of discourse, Derrida thus seeks to reflect on writing as such a means, whose instrumentality he aims at determining in the form of a historical logic of supplementarity. In recent decades history of science has filled this space with investigations on a large number of further media and devices of inscription that are characteristic of the development of the modern empirical sciences and that, to use Bachelard's concept once again, belong to the arsenal of their "phenomeno-techniques."

In his *Grammatology*, Derrida coined the term *historiality* for this iterative-recursive production of meaning in the irrevocable exteriorization of a generalized writing. Historiality goes beyond a mere chronology of events; at the same time, it remains this side of any teleology. The concept of "trace" is central to Derrida's thought about historiality. Writing has the character of a "trace." This concept also shows the distance that Derrida obtains in relation to Husserl, by no longer conceiving the movement of knowledge from an origin toward an end point (no matter how provisional), but rather in terms of its medium: "The trace is not only the disappearance of origin—within the discourse that we sustain and according to the path that we follow it means that the origin did not even disappear, that it was never constituted except reciprocally by a nonorigin, the trace, which thus becomes the origin of the origin."[42] It is only where something is envisaged as a trace that the origin can be conceived as what it is: not a starting point, but rather a construction that is by necessity belated.

Meaning, which for Husserl remained ultimately related to the illusion of an evidence of origin, for Derrida thus lies in displacement itself as a generator of meaning, that iterative process for which, in an essay of 1968 that followed his *Grammatology*, he used the wordplay of *différence*/*différance*. Here, meaning for Derrida is no longer a transcendental phenomenon but rather a diacritical one. The pun involved in his neologism consists in the fact that the difference in vowel is perceptible only in writing. In speech it disappears. Derrida characterizes *différance* as follows:

> In the delineation of *différance* everything is strategic and adventurous. Strategic because no transcendent truth present outside the field of writing can govern theologically the totality of the field. Adventurous because this strategy is not a simple strategy in the sense that strategy orients tactics according to a final goal, a *telos* or theme of domination, a mastery and ultimate reappropriation of the development of the field. Finally, a strategy without finality, what might be called blind tactics, or empirical wandering if the value of empiricism did not itself acquire its entire meaning in its opposition to philosophical responsibility. If there is a certain wandering in the tracing of *différance*, it no more follows the lines of philosophical-logical discourse than that of its symmetrical and integral inverse, empirical-logical discourse. The concept of *play* keeps itself beyond this opposition, announcing, on the eve of philosophy and beyond it, the unity of chance and necessity in calculations without end.[43]

Derrida did not give these basic considerations concrete form in terms of a separate contribution to the history of science. Yet it is not hard to see that the "calculations without end" relate to a meditation on precisely the process of scientific research—"on the eve of philosophy and beyond it"—in which the ultimate task is to engender the new that by its nature is unprecedented and unpredictable.