

## Introduction

After the nineteenth century had seen a new empiricism in the philosophy of science, fed by the rise of the experimental sciences, the end of that century brought a particular kind of crisis—a crisis of reflection on scientific knowledge—without an immediate solution in sight, or even a generally accepted alternative to the century’s legacy. Positivism, in the wake of Auguste Comte in France and the followers of Ernst Mach in the German-speaking countries, was merely the beginning of this turn, the first symptom of the crisis, as it were. Only gradually, in the course of the twentieth century, did a broadly articulated new reflection on science develop. It was fueled by various national traditions and contemporary scientific developments, and it began to historicize epistemology in various ways.

As a result, the contexts of discovery and justification, so neatly separated in between, were joined again. The idea of science as a process replaced the obligatory view of science as a system. *One single* science gave way to many sciences, not reducible to one another. This movement cannot be understood simply as something internal to philosophy or the theory of science; it must be seen in the broader perspective of a dynamics that took hold of the development of the sciences in their entirety, a process which in turn has to be placed within the social and cultural context of the twentieth century as a whole. The premise of the present essay is that the historicization of epistemology represents a decisive moment in the transformation of twentieth-century philosophy of science.

The survey that follows will present a number of authors and schools

of thought, all of which played a part in this overarching movement of historicization. I will not attempt to be all-inclusive but will proceed, rather, by way of selected examples. I also will not seek to conceal personal idiosyncrasies. The order of the chapters is largely chronological, as this is how characteristic shifts can best be shown. Chapter 1 looks at the final quarter of the nineteenth century and the period leading up to the First World War. An initial role here, which must not be underestimated, was played in Germany by the famous and much discussed *ignorabimus* speech of the Berlin physiologist Emil Du Bois-Reymond in 1872. For German-speaking countries, the positivism of the Viennese physicist Ernst Mach, who rejected any kind of metaphysics, shall be compared with the conventionalist views represented in late nineteenth-century France by writers such as Émile Boutroux, from a philosophical perspective, and Henri Poincaré, from a physicalist one.<sup>1</sup> In Chapter 2 I discuss the 1920s, a decade that saw the first works of the Polish immunologist Ludwik Fleck and the French epistemologist Gaston Bachelard. Chapter 3 deals with the period around the Second World War. Karl Popper, Edmund Husserl, Martin Heidegger, and Ernst Cassirer all exerted a major influence in the process here considered, each in their particular way. Chapter 4 discusses the first two decades after the war, focusing on such varied figures as Alexandre Koyré, Thomas Kuhn, Stephen Toulmin, and Paul Feyerabend. Chapter 5 revolves around the poststructuralist turn of the 1960s. Its actors include Georges Canguilhem (in the tradition of Bachelard), Louis Althusser, and Michel Foucault (in turn in the tradition of Canguilhem), as well as Jacques Derrida, whose method of deconstruction took its starting point from an engagement with the late writings of Husserl. Chapter 6, finally, deals with the “practical turn” in the philosophy and history of the sciences as well as in science studies, which was also an anthropological turn represented here by Ian Hacking for the English-speaking world, and by Bruno Latour for France.

My use of the term *epistemology* requires a brief explanation. I do not use it as a synonym for a theory of knowledge (*Erkenntnis*) that inquires into what it is that makes knowledge (*Wissen*) scientific, as was characteristic of the classical tradition, especially in English-speaking countries. Rather, the concept is used here, following the French practice, for reflecting on the historical conditions *under* which, and the means *with* which, things are made into objects of knowledge. It focuses thus on

the process of generating scientific knowledge and the ways in which it is initiated and maintained. If I am right, the turn from the nineteenth to the twentieth century marked a pivotal point, at which theory of knowledge in the received sense started to be transformed into epistemology in the sense in which I use the term here. This shift also marked a transformation of the problem situation. A reflection on the relationship between concept and object from the point of view of the knowing subject was gradually replaced by a reflection of the relationship between object and concept that started from the object to be known. This shift in the problem constellation is at the same time both at the core of epistemology and the point of departure for its historicization. Not by chance, an epistemology and history of experimentation crystallized conjointly. The question now was no longer how knowing subjects might attain an undisguised view of their objects, rather the question was what conditions had to be created for objects to be made into objects of empirical knowledge under historically variable conditions.

This change went with another shift of interest in the theory of knowledge. The previous orientation of finding and presenting the correct scientific method, which would be obligatory in all possible contexts, was replaced by a detailed interest in what scientists actually do in pursuit of their specific research. This gave rise to the question of whether scientists' actions, instead of following a timeless logic, were themselves subject to a historical development whose temporal course could be followed and whose particular conditions had to be ascertained. Historicization of epistemology thus also means subjecting the theory of knowledge to an empirical-historical regime, grasping its object as itself historically variable, not based in some transcendental presupposition or a priori norm.

At least to start with, a considerable part of the work of reflection that produced this turn was conducted within the sciences and by scientists themselves, rather than arising from the debates and trench warfare of academic philosophy. Thus the present investigation will also show how the process of historicization to which epistemology was subjected in the twentieth century was closely connected with the development of the sciences in this period.

In parallel with the historicization of the philosophy of science, a process unfolded that can be described as the epistemologization of the

history of science. Both movements, which are to be combined under the concept of historical epistemology, give the resulting history its robustness and strength. In this connection, two events stand out above all. The first is the supersession of physics in its classical form. Connected with this, the question of scientific revolutions became unavoidable. The second is the fact, which became ever clearer, that all the sciences cannot be gathered under the same roof. This second point—and with it, the growing acceptance that it does no damage to the dynamic of the sciences if they cannot be unified, but that their plural constitution seems rather to be part of their irresistible modern drive—has developed over time perhaps still greater force. Let us now see how this development came about, and what its main lines of development were, by way of a close reading of a number of key texts.

## Conclusion

We have reached the end of this journey, which has led over a century of reflection on the sciences, their constitution, and their changes. It began with the idea of a kind of mimicry, the idea that the historical pursuit of science would follow the inductive course of the sciences, purged of its accidental hesitations. Via a series of shifts in the historical understanding of the relationship between science and technology, it led to the opening up of a field that took shape, not least in the debate with phenomenology after the First World War, and finally flowed into the quest for a new definition of the age of modernity at the end of the Cold War. What began as epistemological reflection emerging at the margins of classical mechanics opened out into different approaches and attempts at a genuine historical epistemology. It sought, steering its way between the poles of an empirically underpinned historicism based on the causal linkage of facts and a traditional, anthropologically motivated rationalism that privileged the consciousness of the knowing subject, to reveal the specific life of the sciences and their development.

In the course of time, historical reflection on epistemology began to merge with epistemological reflection on the history of science. It is no accident, seen from this perspective, that means and media have moved center stage—gradually but increasingly—in a comprehensive analysis of scientific practices in all their discursive and material dimensions. If it is ultimately from this shift that the question of a historical anthropology of the sciences has been newly raised, the latter should not be misconstrued as a return of anthropocentrism, either in its empiricist-decisionist variant or in its

rationalist-creativist one. It should rather be read as an attempt, in the context of a thoroughly altered system of coordinates of the growth of science, no longer defined in Cartesian terms, to newly assess the role of human actors and their ever changing position in a network that embraces them and yet allows them to remain decentered.

The building blocks of a new, genuinely historical-epistemological discourse, which initially came rather from the margins of established scientific disciplines, were likewise introduced by outsiders in a discussion that was at the beginning still carried on in terms of academic philosophy. More than a few of these figures came out of the sciences themselves. As could also be observed, we are not faced from the start with a continuous discourse handed down from one scholar to the next. The twentieth century, with its major political events and its legacy of national traditions, was too riven to allow such continuity. Moreover, the intellectual migration forced by National Socialism also tore up existing traditions, especially in the German language zone. The dislocations and international reshufflings this brought about have still not been worked through in terms of a history of philosophy of the twentieth century.

And yet, as the positions presented in these brief portraits show, there was a persistence of a set of problems, which time and again arose from different perspectives and in different contexts. These problems were raised and re-actualized repeatedly by the developmental dynamic of the twentieth-century sciences themselves. If we wanted to seek a continuity, it would be the continuity of changes and breaks that the sciences underwent in this century. Correspondingly, it can be stated that at the end of the century there is no longer any epistemology fruitfully intervening in discussion of philosophical questions of the sciences that is not permeated by historical questions. The idea of a linear development of knowledge, continuous and cumulative, from a teleological perspective, has gone, along with the idea of a unitary science that would embrace everything, centered firmly in physics. In its place, however, as the preceding presentation has shown, we do not have a new prevailing and compelling model. The space of historical epistemology has itself become plural in keeping with the course of its development. Perhaps it is a lesson learned from the pluralization process of the sciences in the twentieth century that such unity is not needed in order to advance. Historical epistemology has its own permanent laboratory in the past and future history of the sciences.