Axiomathes
https://doi.org/10.1007/s10516-021-09574-3

ORIGINAL PAPER

Philosophy of Science and Philosophy: The Long Flight Home

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Received: 20 May 2021 / Accepted: 20 June 2021

Abstract
In this article, I argue that there is philosophy of science since philosophy existed. Thus, the idea that the philosophy of science was born with neopositivism is historically wrong and detrimental to the development of the philosophy of science itself. Neopositivism tried to found the philosophy of science as an anti-philosophical discipline, as a field of study that came to replace simple philosophy. The attempt was maintained for thirty years, but failed. Now, this does not mean that we cannot make good philosophy of science today, but that the philosophy of science has returned to the common house of philosophy, it is gradually recovering the connection that it should never have lost with the main philosophical traditions and disciplines.

Keywords Origin of the philosophy of science · History of the philosophy of science · Neopositivism · Philosophical traditions · Contexts distinction

1 Introduction

> "Why can we not just be 'philosophers' without an adjective?"
> Hilary Putnam (1997, p. 208).

Since there is philosophy as such, there exists also philosophy of science. We can find deep philosophical reflections on science already in Plato's dialogues. Nevertheless, the philosophy of science was not institutionalized until the 20 s of the last century, under a neopositivist perspective. Actually, the philosophy of science as an institutionalized discipline was intended to replace the traditional philosophy; it was born, in fact, against the traditional philosophy. This attempt to replace simple philosophy with a new discipline called philosophy of science failed, as is well known. Today, philosophy stays alive in the hermeneutical, phenomenological, analytical, Aristotelian tradition…, and many others, both western and eastern. Philosophy has

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Published online: 03 July 2021

not disappeared, but has grown and flourished itself over the last hundred years. The philosophy of science, understood as the overcoming of simple philosophy, was an anomaly that lasted barely thirty years, from the dawn of neopositivism, until the contributions of Karl Popper (1959) and Thomas Kuhn (1962) back in the 60 s of the last century. From there, the philosophy of science undertook a slow return to the common home of philosophy. This process should be completed as soon as possible. For this, it is probable that the philosophy of science must address a kind of re-foundation, so that it assumes its true nature. It is one more branch of the trunk of traditional philosophy, not an alternative to it. In this article, I will try to relate this process. In doing so, I hope to contribute to the complete reintegration of the philosophy of science into the common home of philosophy.

2 When was the Philosophy of Science Born?

What do we mean when we affirm that the philosophy of science was born with neopositivism? This statement is obviously incorrect in the historical-philosophical sense. Therefore, it is important to highlight this fact, because this false self-image has contributed to enclose the discipline in a certain school, to which life is supposed to owe, and to limit it to a certain constellation of problems, precisely those that can be treated with the conceptual tools of that school. If we want to relocate the philosophy of science in the common house of philosophy, we must begin by correcting this misguiding self-image. The philosophy of science was born, at least, with modern science, in the writings of Galileo, Descartes, Newton or Bacon. Although probably, to be fair, we should go further back, to the late medieval philosophers and, even more, to Plato and Aristotle.

However, the claim that the philosophy of science was born with neopositivism is true in the sociological sense. In fact, it is always supported by sociological data. A chair was founded in Vienna, a group was created in Vienna that establishes connections with others in Berlin or Warsaw, a journal and a books series dedicated to the philosophy of science were launched, the holding of congresses and so on… All of them are facts of a social nature, not ideas of a philosophical character. In short: only the sociological perspective saves the foundational position of neopositivism, although this movement was not particularly fond of sociological studies.

Now, sociology aside, from the point of view of philosophical content, what is the historical place of the work of Rudolf Carnap or Hans Reichenbach? "We tried to avoid—says Carnap in his *Intellectual Autobiography*—the terms of traditional philosophy" Carnap (1963, p. 21). Even clearer, in his famous *Aufbau*, Carnap affirms that when philosophy began to take the requirement of scientific rigor seriously, it necessarily came to the fact of having to ban all metaphysics from philosophy, since its theses cannot be rationally justified (Carnap, 1928, Preface to the First Edition).

Moreover, in the same sense we can quote Reichenbach, who in 1938 published *Experience and Prediction, an Analysis of the Foundations and the Structure of Knowledge*. In the preface of said text he affirms that, as a whole, it is written within the spirit of logical empiricism, a philosophical movement in which thinkers militate who agree on the "strict disavowal of the metaphoric language of metaphysics" and

on "the submission to the postulates of intellectual discipline" (Reichenbach 1938, p. v). In other words, according to the neopositivists, only in the new philosophy of science there is intellectual rigor, which the philosophy that has been practicing until now lacks. Neopositivism is outlined here as a kind of Adamism, as an attempt to give philosophy a new beginning, to the exclusion of everything that had been done up to now.

However, the truth is that there has been a rigorous philosophical reflection for more than two millennia. In addition, not only that, but within this traditional philosophy, since ancient times, there is a very rigorous body of thought on the scientific phenomenon. Let's see.

3 The Philosophy of Science in the Philosophical Tradition

Perhaps Plato was who first systematically dealt with knowledge and, especially, with that form of knowledge that we can call science (*episteme*), and that he sharply differentiates from opinion (*doxa*). In addition, Plato's work served as an inspiration to astronomers for centuries. Such an influence of a philosopher on real science should make us reflect on the origin of the so-called philosophy of science. The idea that this science seeks to save the phenomena (*sozein ta phainomena*) by reducing all apparent motions to circular and uniform orbits is still known today as the Platonic program for astronomy. In addition, in the dialogue *Republic* he established the great metaphor that has served as a framework for a multitude of later methodological studies. Let us remember the so-called myth of the cave, which appears in *Republic VII*; there he formulates the question of knowledge explicitly in terms of an arc with two ways, *ascent* and *descent*. Authentic knowledge is only achieved by ascending through a process of catharsis of the soul, which allows the subject seeing (or perhaps remembering) the Ideas (*Meno* 81b-d, 82b-85b; *Phaedo* 72e, 75). From there, we will be able to descend safely, deductively inferring, from the Ideas to the peculiarities of the sensible world.

The method proposed by Plato has been severely criticized, but the idea that a research method can be established that is at the same time sufficient justification of the findings obtained, the idea that beliefs can be validated by their origin, remained until recent times.

Along with Plato, or even above him, Aristotle is perhaps the philosopher who has most influenced scientific practice of all time. The classic place for the Aristotelian methodology is the *Analytics*. *The Prior Analytics* are devoted to the study of deductive inference in its syllogistic form. In such an inference, the truth is safely transmitted from the premises to the conclusion. Nonetheless, syllogistic are of no use to us if what it is about is to investigate the premises from which the deduction must start. Unless these can be deduced from others. However, we cannot go on like this indefinitely, and at one point or another, we will have to be faced with the task of searching for principles from which we can begin to deduce. The descent, as in the case of Plato, is clear: it occurs by deductive inference with preservation of the truth. However, in the *Posterior Analytics*, Aristotle deals with the search for such principles by more creative (but less safe) methods than the syllogism. It is about

what we can call induction from observed phenomena and intuition of the appropriate principles. There is even a similarity between the Aristotelian *epagoge* and the method that Charles S. Peirce called abduction.

On the other hand, part of the rhetorical technique consists of the invention or discovery of the arguments that will be used during the presentation. Aristotle devoted many pages to rhetorical studies and was, according to Cicero, the founder of the art of discovery. Nevertheless, Cicero (*Topics*, II, 6) was the first to speak explicitly of the *ars inveniendi* as one of the branches of rhetoric, the one that deals precisely with the discovery of arguments. The other branch of rhetoric will deal with the presentation or exposition and justification or evaluation of them. The Ciceronian distinction between discovery and justification passed into the Middle Ages, as an integral part of the *Trivium*, as via *inventionis* and via *judicii*.

From this situation, medieval methodological investigations were construed as a display or commentary on Aristotle's *Analytics*. What the Greeks called *analysis* and *synthesis*, was called *resolutio* and *compositio* by the medieval thinkers of the school of Padua. The methodological models continued to be taken form geometry and rethoric. On the one hand, the axiomatic-deductive method of geometry, in the Pythagorean tradition, with its splendid security in the transmission of the truth from one statement to another and, on the other hand, rhetoric with its *ars inveniendi*. However, some steps were taken towards recognizing the impossibility of finding a deductive ascent method. Faced with such recognition, it just remain to refine the inductive methods, as Roger Bacon, Duns Escoto and Occam did, or to try the hypothetico-deductive method, as, according to Crombie (2002), Grosseteste did. Medieval methodologists from Oxford and Padua established the need to assume regularity in nature for induction to be valid, and the convenience of sticking to a principle of simplicity in explanation. Ultimately, they saw that the route of ascent would lack logical necessity without these assumptions.

Thus, the conviction that there is inexorably a difference between physics and geometry in terms of the degree of certainty appears strongly. Grosseteste accepts that only in mathematics there is proof in the strict sense. In the school of Padua, the knowledge offered by experimental science came to be considered as conjectural. Occam, as well as Nicolas d'Autrécourt, took the probabilistic consequences to extremes, denying the possibility of universal knowledge and of establishing causal connections and necessary natural laws. As Crombie points out, at this time there are tendencies towards scientific skepticism or, at the very least, clear instrumentalist stances.

However, during the centuries of the Scientific Revolution -let's say from Copernicus to Newton-, with the effective success of the new science, the confidence in the possibility of establishing a safe method reappears. Both Francis Bacon and René Descartes, each in his own way, tried to establish scientific knowledge on firm foundations. Descartes opted for deduction as a method and Bacon for induction.

In Bacon, the interests of the methodologist converge again, as they did among the Greeks and the Mediaeval, with the influences coming from rhetoric. Bacon thus distinguished four types of intellectual arts (which we could easily project onto the current contexts distinction): the *art of invention*, that of *examination or judgment*, that of *conservation or memory*, and that of the *transmission* of knowledge.

However, Bacon's ideas that most influenced later scientific thought were those that he expressed in his second book of the *Novum Organum*, that is, his inductive logic, the so-called Baconian method.

Bacon's image as the founder of the new science thanks to his discovery of the inductive method was highly appreciated by the founders of the *Royal Society* and the authors of the great *Illustrated Encyclopedia* (Rossi 1957). Moreover, some Baconian elements can still be detected in Leibniz. Thus, Leibniz adopted as a *desideratum* the idea of an inventive logic. The tendency towards the automation of the processes of creation and the assimilation of all mental operations to a calculation are also present in his project of a *universal characteristic* (Rossi 1983), which must serve both for the invention and for the judgment. It appears that the universal language is part of a program to find a standardized, automatable, *ars inveniendi*.

The next major turning point in our history -which in my opinion constitutes a point of no return- is David Hume's critique of inductive inference. Induction lacks validity or launches us into an infinite process. On the other hand, Hume, in his *Enquiry*, lays the foundation for a change regarding the meaning of the terms "analytic" and "synthetic". He speaks in terms of *relations of ideas* and *matters of fact* (section IV, part I). Nevertheless, from this distinction will derive the one that Immanuel Kant presents between *analysis* and *synthesis*. It becomes clear that, to the extent that the objects of knowledge mutate from being things to being ideas, as occurs in both the rationalist and empiricist traditions, "analysis" can no longer refer to the analysis of things (as occurs in chemistry, for instance), but rather of our ideas or representations. Thus, *analyzing* an idea that we have is a safe but sterile procedure, while adding another that we can obtain through experience is a *synthetic* movement that expands what we know, but, regrettably, in an uncertain way. In Kant (*KrV* B 103, A 7), the turn has already been completed, and "analysis" and "synthesis" take on the meaning that is more common to us today.

Here is the uncomfortable need to choose. Kant was shaken by Humean criticism as much as by the overwhelming success of Newtonian physics or ancient geometry. However, uncertain physics and geometry with no connection to the world, as Hume claimed, were truly unsettling. The answer for Kant was the *synthetic* a priori. Knowledge therefore depends on what the subject contributes. The epistemic subject contributes pure intuitions for mathematics, pure concepts for physics, and ideas of reason as rules. Kant restructures the theory of knowledge to overcome Humean objections. From this results, at least, clear evidence of the subject's activity and the importance of theoretical and systematic aspects in science. Strict empiricism and the passive epistemic subject, who diligently manages what experience gives him (the data), are already old news.

4 The Neopositivist Seclusion of the Philosophy of Science in the Context of Justification

The philosophers of science in the nineteenth century dealt primarily with facing this new situation. They tried to accommodate or isolate what the subject contribute to knowledge, without yet yielding to the idealistic pull, and without suffering

the objectivity of scientific knowledge. Post-Kantian empiricists such as John Herschel (1833) and William Whewell (1840) tried a new strategy: they thought that the objectivity and credibility of science is based, above all, on the verification or justification of its statements, its laws and theories, not on the method by which they were discovered. In other words, for the first time it is established that justification is to be sought in the descending branch of knowledge, while discovery remains fixed in the ascending branch. This distinction allows for greater methodological freedom on the discovery side.

The nineteenth century and the beginning of the 20th witnessed a slow erosion of the Newtonian world. At these moments, they appeared the physics of light, electromagnetism, thermodynamics and, finally, Relativistic and quantum physics. They emerge as well the new geometries (both Lobatschewsky's and Riemann's geometries were realized during this century). The consequence was the progressive distrust in the immutability of Kantian aprioric structures. To this must be added a factor of enormous importance, namely, the awareness of the evolutionary origin of man, which at the end of the nineteenth century was decisive for the formulation of some new epistemologies, such as those of Friedrich Nietzsche or Charles S. Peirce, which very clearly questioned the Kantian structures.

With all the nuances that you want, and that we cannot develop here, several thinkers in the late nineteenth and early twentieth tended to weaken the confidence in scientific knowledge, or at least, in a very marked way, in the scientific theories that had traditionally been depositories of this confidence. Henry Poincaré (1902) sets out towards conventionalism, Ernst Mach (1883) towards phenomenalism and Pierre Duhem (1906) towards instrumentalism, not to mention the romantic and psychological tendencies of the time.

One way to settle the issue was the deepening of the strategy already outlined by philosophers of science since the mid-nineteenth century, that is, the radical separation of what historically had been tried to conjugate: the process that leads to obtaining a discovery and the justification for it. In other words, justification cannot be in the ascending branch of knowledge, we have to explore the possibilities offered by the other branch, the descending one, for justification. The methodology, whether inductive or deductive, will henceforth refer to the degree to which the consequences of a hypothesis justify it or allow, at least, to choose it with reason among the several available. It does not matter whether the discovery comes from the dream or from the systematic annotation, no matter its origin, it does not matter where we get our hypotheses from, the important thing is that they were impartially judged and objectively established according to a logic of justification.

After the tour we have done, we can see that there is a philosophy of science since the dawn of philosophy. The philosophical reflection on science has been cultivated in a continuous and rigorous way since Antiquity. Furthermore, this philosophical reflection has profoundly influenced scientific development itself, which we cannot say about the institutionalized philosophy of science that was practiced between the 30 s and 60 s of the last century. On the other hand, it is now observed that the neopositivist proposals are, in reality, part of a long history and not an *ex nihilo* invention alien to all previous philosophy.

5 Conclusion: The Liberation of the Philosophy of Science and its Return to the Common Home of Philosophy

The search for a logic of verification was not concluded, and Popper falsificationism could never give an answer to Duhem's arguments in the field of logic, but he tried to do so in the field of methodological maxims and values that should guide science (Artigas, 1998). For his part, Kuhn affirmed that recognising that the criteria of choice between theories can function as values because they are incomplete as rules has many advantages Kuhn (1977, chapter 13).

Popper's own movement towards a less narrow vision of rationality in science, which is made more flexible in the form of maxims and which is expanded to include axiological elements is a promising indication. Popperian fallibilism, as well as the connection that Kuhn appreciates between forms of social organization and the possibilities for the development of science are also suggestive elements. These ideas trace the route, the way back from an isolated philosophy of science to the common home of philosophy, i.e., to the philosophical tradition. The philosophy of science has to be formulated, as not only a logic and semantics of science, but also as ethics and political philosophy, as aesthetics, as epistemology, metaphysics and theodicy.

For the philosophy of science, neopositivism (and its sequel, the so-called *received view*) is simply one more school from the point of view of the philosophical content. It is not little, but that is all. The philosophy of science must, therefore, fully reconnect with the rest of the philosophical disciplines and traditions and dispense, finally, of its erroneous self-image. No, the philosophy of science is not born with neopositivism, it does not depend on it. The philosophy of science does not owe to neopositivism more that it owe to many other traditions of thought.

The turn that first appears in the works of Kuhn and Popper initiates an authentic liberation of the philosophy of science, which can finally leave the cage of the context of justification without losing sight of the question of rationality. The rationality that consists, precisely, of an integrating function, cannot be divided into parcels. The rationality of science, the rationality of the action of the scientist, of the scientific community, of the societies that produce science and depend on it, cannot be evaluated if it is not for its place in the whole of human life. Without this broad perspective, any attempt to save the rationality of science ends in disappointing irrationalism. The philosophy of science as a whole cannot lose sight of this broad perspective.

Consequently, I sustain that the philosophy of science can and must develop itself along new dimensions. The philosophy of science must open itself to the consideration of new contexts, the integration of science into a network of systemic relationships with other areas of life, the extension towards the practical, the opening towards other traditions than analytical and towards other branches of theoretical and practical philosophy. It should as well increase the number of disciplines with which the philosophy of the special sciences must deal. It has to expand itself in terms of the public to which it is directed and, for this, to tolerate diverse expressive modes and styles, which do not have to be always tied to the analytical canon.

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