

WHAT IS THE VALUE OF PHILOSOPHY OF SCIENCE FOR HISTORY OF SCIENCE?

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Abstract. The study proposes as a reflection topic the interrelation between philosophy of science and history of science. Presented as a reverse of the question developed in the *Structure of Scientific Revolutions*, this is an opportunity to discuss and nuance the descriptive, chronological and apparently linear and progressive approach of the history of science, as well as to assess aspects of the scientific progress and of the approach of scientific progress in contemporary terms. Philosophy of science contributes by general conceptualizations and perspectives that are establishing a second order of acknowledgement of knowledge, analysing concepts as *validity, methods, hypotheses, scope* of the theory of knowledge. Philosophy of science rejects the mirror of nature (R. Rorty) and contributes to the growth of knowledge and the history of science in a crucial manner via the concept and method of falsification (K. Popper). Philosophy of science conceptualizes selectivity of historical judgement. (P. Hoyningen-Huene). Philosophy of science contributed to history of science imposing the importance of meaning, conceptualization, hermeneutics and contextualization for the scientific endeavour.

Keywords: philosophy of science, history of science, scientific progress, knowledge, mirror of nature.

Introduction

This theme of reflection reverses, in our view, the Kuhnian question developed by the *Structure of Scientific Revolutions*. In this crucial book, Thomas Kuhn sustains that it is the merit of history of science to have emphasized the role of paradigms in the development of science. In our view, philosophy of science provides history of science first of all with settings, or with interrogated, or overpassed and cancelled foundations, with frameworks of conceptualization, all called to place in perspective and nuance, the descriptive, chronological and apparently linear and progressive approach of the history of science. Even more, the contribution of the former only improves the legitimacy of the latter and it does not cancel its legitimacy. Nevertheless, this rather general observation does not exhaust the proposed problem and the complete answer unfolds as following.

In order to capture the value of philosophy of science to the history of science is useful to define our terms. The history of science is the sum of the accounts of change documenting the progress of the scientific truth, or the actions taken to documenting main events in the development of these scientific domains. In the *Structure of Scientific Revolutions*, “science” is illustrated by instances of development in biology and physics. Biology and physics are selected because they embody the idea of objective truth brought about via empirical study but they do not exhaust the domains of knowledge and they are not perfect images of knowledge in its entirety. But who

selects these main events? Is it really the merit of the historian? It is the merit of philosophy of science which we define as the totality of inquiries on the foundations, the methodological views, the tests and justifications, as well as the implications of science to assign the place and the role of main events, more in their interpretation of relevance for a theory and process of knowledge, than within the narrow stream of disciplinary development.

What represents history of science for philosophy of science?

Both history of science and philosophy of science are concerned with the development of knowledge. Philosophy of science contributes by general conceptualizations and perspectives that are establishing a second order of acknowledgement of knowledge, concerned with concepts as *validity, methods, hypotheses, scope* of theory of knowledge (in general, not within the confines of the theories describing the atom, for instance), distinctions between *justified beliefs* and *opinions* in general, and other generalizations of knowledge to the history of science which is more likely to remain closer to the specificity of the domain historicized (e.g. the history of the science of engines from steam mechanisms to magnetic engines). An important part of the history of science is dedicated to the improvement of methods, experiments and perspectives (the rest being concerned as well with the theories of *knowledge of ... something*) and philosophy of science (concerned with knowledge as general and universal knowledge, or *knowledge that* in conformity with the Aristotelian distinction) is valuable to each of these parts in terms of conceptualizations and generalizations as well as in terms of actualization a nuanced and specified studied aspect.

Philosophy of science is interested in theories of knowledge that cannot be discussed only in terms of theories assigned to experiments or in terms of theories easily oriented from origin or beginners' level toward an ulterior level approximating the final level of the theory capturing the objective truth, while the history of science is largely oriented development of knowledge assessment. Philosophy of science is always situated at that "final" point, at a higher level of generalization: it is always describing the capturing and justification of the objective truth. This way, philosophy of science entertains a meta-theoretical dimension. History of science is always situated on the "road" toward the objective truth. In this respect, we can notice that the level of generalization in the enterprises of knowledge assessment increases from the history of science toward philosophy of science (human-centred theory of knowledge) and toward gnoseology (on the one hand, more metaphysical, and, on the other, which could be concerned also with the AI theories of knowledge).

Philosophy of science is able to conceive refusing the mirror of nature, while the history of science holds on to a "broken" mirror of nature ("broken", because historical mirroring of knowledge development is accompanied by the shadow of setbacks and fragmented evolutions) as we intend to explain further. We are referring to the concept of mirror of nature proposed by Richard Rorty, in a pragmatic approach to the philosophy of science as general theory of knowledge. The mirror of nature rejected in this work (*Philosophy and the Mirror of Nature*, 1979) is the sum of consequences brought to the understanding of knowledge as (scientific and) objective truth through

the representational theory of perception and through the theory of truth as correspondence. These two fundamental epistemological theories are overpassed by Richard Rorty in a critical and somewhat surprising approach, which labels the problems generated by the above-mentioned theories as products of language games and not genuine philosophical problems.

R. Rorty interprets the Kantian contribution to the creation of “philosophy-as-epistemology” in a way in which illuminates our discussion concerning the value of philosophy of science to history of science. For Rorty, Kant raised “the science of man” from an empirical to an a priori level and this way succeeded to describe a self-conscious and self-confident philosophy-as-epistemology in three steps: first, Kant identified the central issue of epistemology as the relations between two types of representations (the concepts, “formal” and the intuitions, “material”) connecting the problems of knowledge and those of reason and of universals. These central relations are valuable to modern history of philosophy mostly conceived as a type of history of science. The second step was that Kant linked “epistemology to morality in the project of 'destroying reason to make room for faith' (that is, destroying Newtonian determinism to make room for the common moral consciousness), he revived the notion of a 'complete philosophical system,' one in which morality was 'grounded' on something less controversial and more scientific. [...] With Kant, epistemology was able to step into metaphysics' role of guarantor of the presuppositions of morality. Third, by taking everything we say to be about something we have 'constituted,' he made it possible for epistemology to be thought of as a foundational science, an armchair discipline capable of discovering the 'formal' (or, in later versions, 'structural,' 'phenomenological,' 'grammatical,' 'logical,' or 'conceptual') characteristics of any area of human life.”¹ With this third step, as Rorty argues, the meaning of *mirroring* becomes very clear: extracting knowledge, the theories of knowledge identify the formal characteristics of any area of human life, their ultimate structure, their logic, their grammar. This is precisely what Rorty parts the way with in a pragmatic approach inscribed in the traditions of Dewey, Wittgenstein II and Quine.

“In characterizing an episode or a state as that of knowing, we are not giving an empirical description of that episode or state; we are placing it in the logical space of reasons, of justifying and being able to justify what one says.”²

Mirroring is undermined by conceiving the constitutive action of the mind³ and knowledge as justified true belief and as result of the relation between a person and a proposition (while Kant talked about inner representations in place of sentences, thus missing the pragmatic turn). The objective truth dissipates into a constellation of

¹ Richard Rorty, *Philosophy and the Mirror of Nature*, Princeton, Princeton University Press, 1979, pp.138–9.

² Wilfrid Sellars, *Empiricism and the Philosophy of Mind*, London, Routledge & Kegan Paul Ltd, 1963, p. 131 and R. Rorty, *op. cit.*, p. 141.

³ Richard Rorty, *Philosophy and the Mirror of Nature*, Princeton, Princeton University Press, 1979, p. 147.

necessary and contingent truths. Indicating that, philosophy of science offers history of science the grounds to distance from the centrality of mirroring in the assessment of the development of knowledge.

Philosophy of science proves the importance of the accuracy of representations and the difficulty of this enterprise. The accurate representations are the result of the perfect analogy between knowing and perceiving and a consequence of the unchallenged foundations of knowledge. The idea that the foundations of knowledge exist is inherited from Plato and indicates the analogy between knowing and perceiving, but in Rorty's perspective we should limit the analogy to knowing and perceiving justified beliefs, limiting the expectations for accurate representations. This is the only way we can distance the Eye of Mind from confused representations to focus on the clear ones.⁴ Russell's "logical form" and Husserl's "essences" (purely formal aspects of the world) attempted to capture the clear ideas, the accurate representations, and the foundations of knowledge: all examples of attempts of mirroring. And these attempts are far from securing mirroring success. Rorty quotes Quine according to whom "a necessary truth is just a statement such that nobody has given us any interesting alternatives which would lead us to question it."⁵

The conclusion of the Rortian incursion into a philosophy of knowledge, which places the accent on philosophy and pragmatism, too, is that to set the destination of knowledge in mirroring nature is at once not possible and not so relevant from the human knower standpoint. Rorty emphasizes: "The historian can make the shift from the old scheme to the new intelligible, and make one see why one would have been led from the one to the other if one had been an intellectual of that day. There is nothing the philosopher can add to what the historian has already done to show that this intelligible and plausible course is a 'rational' one. Without what Feyerabend called 'meaning invariance,' there is no special method (meaning-analysis) which the philosopher can apply. For 'meaning invariance' was simply the 'linguistic' way of stating the Kantian claim that inquiry, to be rational, had to be conducted within a permanent framework knowable a priori, a scheme which both restricted possible empirical content and explained what it was rational to do with any empirical content which came along. Once schemes became temporary, the scheme-content distinction itself was in danger, and with it the Kantian notion of philosophy as made possible by our a priori knowledge of our own contribution to inquiry (the schematic, formal element - e.g., 'language')."⁶ In this respect, though, the philosopher does something more than the historian: she is the one who places the quotation marks, functioning as the flat sign to a musical note, or, the grain of salt if you like, on the majestic clear ideas, on the permanence of frameworks knowable a priori.

In order to emphasize the value of philosophy of science for history of science, we are using the same expression, mirror of nature, with a slightly different and consequent

⁴ *Ibidem*, p. 161.

⁵ *Ibidem*, p. 175.

⁶ *Ibidem*, p. 272–3.

connotation: the refusal of the hegemony of the notions of *progress* and *truth* in scientific endeavours beyond their philosophical or more historical nature. Against this background, by the “relativization” of the notions of truth and progress, philosophy of science contributes to a more accurate and relevant image of the history of science.

We cannot say that the philosopher and the historian are in different worlds, with wildly different methods, visions, purposes, results and understanding of the Universe(s). The historian of science finds herself immersed within a sea of scientific problems and solutions, which are already ordered chronologically and which seem to be ordered progressively, too (because they move from obsolete definitions, methods, techniques and results to up-to-date definitions, methods and procedures in science), and other problems, newer, which may fit or not the previous narrative and which may have or not definite and accepted solutions. However, as we know from Thomas Kuhn⁷, history of science is rather a string of catchy “beans”: scientific actions, experiments, theories (events) which congeal in paradigms and form either one bean or another. Each paradigm includes problems and solutions as well as methods of problem solving, forming a totality, a vision on things a vision of on ideas and therefore a specific vision on what is knowledge. Even more, each “bean” is characterized by its own vision, its own Universe of scientific problems and solutions, in other words, the paradigms are incommensurable (the problems and the solutions proposed are different *in nature*). They lack common measure, because the “metre” of the scientific nature of a paradigm is not yet invented. The scientific paradigms that succeed one another are not more of the same view. They are different worlds, because they are founded on different manner of conceiving the world (in contrast to derived or opposed methods of conceiving the world). The Newtonian concept of mass (as property of the physical body) is not comparable to the concept of mass introduced by Einstein (mass is a correspondent of energy), not *because* the latter is more complete, deeper, or better tested. The latter concept conceived things in new and surprising ways, *although* it seemed to fit indeed better some other advancement in chemistry and in nuclear experiments.

The story of the succession of the *different* scientific types of theories told by the historian registers the diversity of the areas and of the components of knowledge, a body of knowledge composed by the results of science, as well as the surprising directions and turns taken by these theories, but the core of the meaning of scientific results from a meta-disciplinary (inter- and trans-disciplinary) perspective, the fact that there is a wider than disciplinary perspective on science, let us say, the paradigmatic and incommensurable character of theories even within the disciplines is rather the preoccupation of the philosopher of science. This aspect nuances the idea of scientific progress and that view of the glorious science smoothly and steadily conquering the “new territories” of the unknown. The historian of science shall always be interested to document scientific error, result and change, while the philosopher of science shall always be interested in the process of proposing clear and relevant theories, ideas,

⁷ Thomas Kuhn, *The Structure of Scientific Revolutions*, Chicago, University of Chicago Press, 1962.

conceptual frameworks and in testing their conceptions, ideas, theories etc. In this respect, philosophy of science provides the very “taxonomic key” for the material to be documented: the puzzle, its description *as puzzle* and the awareness of the provisory and tentative nature of its interpretation.

A brief anecdote brings an interesting perspective to the discussion. There was once a scientist who was studying fleas. She placed it on a white sheet of paper to see it better and told it: “Jump!” And that flea jumped. And tested again: “Jump!” And that flea jumped. The scientist tested again, and again, and again. Then, she cut flea's legs off. When ordered to jump, the flea jumped no more. The scientist wrote in her observation note-book: *A legless flea is deaf*.

What does this anecdote capture? A first consequence of the anecdote is *the puzzle* and its role in science: problematization, a suspicion of anomalies or an indication of difficulties (difficulties to be solved and difficulties implied). History of science documents the experiment as relevant, rather for routine and development of knowledge via accumulation, than for change. Second, the anecdote also emphasizes the limits of reason and the ruses of reasoning (interpretation), which is in this case as important as the identification of the puzzle and the care for the scientific conduct of the approach. And third, aberrant reasoning does not always present itself as such, in an obvious fashion. This is also the problem of the Gettier⁸ examples and the anecdote could qualify as a Gettier example itself.

Philosophy of science interprets the proposed puzzle opening or not avenues to reassess the premises and the results within or outside philosophical traditions and directions. Thomas Kuhn defined the *puzzle* as a synonym for *problem* and question into the scientific endeavour. The Popperian interpretation of the puzzle is a linguistic game deprived of substance. The puzzle is not just a linguistic game since the dimension of linguistic game entertained by a puzzle does not cancel its scientific content which is present and justifies its involvement in the scientific interrogation; in narrative of justification or in the narrative of discovery or in both, posed as part of a wider hypothesis or as the very starting point of an investigation. Kuhn's examples of puzzles are the transition processes from one world to another in child development at Piaget or the philosophical puzzles of the analytic-synthetic distinction at V.O. Quine.⁹ Here is the definition:

“Puzzles are, in the entirely standard meaning here employed, that special category of problems that can serve to test ingenuity or skill in solution. Dictionary illustrations are ‘jigsaw puzzle’ and ‘crossword puzzle,’ and it is the characteristics that these share with the problems of normal science that we now need to isolate. One of them has just been mentioned. It is no criterion of goodness in a puzzle that its outcome be intrinsically interesting or important. On the contrary, the really pressing problems, e.g., a cure for cancer or the design of a lasting peace, are often not puzzles at all, largely because they may not have any solution. Consider the jigsaw puzzle whose pieces are selected at random from each of two different puzzle boxes. Since that problem is likely to defy

⁸ E. L. Gettier, “Is Justified True Belief Knowledge?” *Analysis* 23, 1963, pp. 121–3.

⁹ Thomas Kuhn, *op. cit.*, p. vi.

(though it might not) even the most ingenious of men, it cannot serve as a test of skill in solution. In any usual sense it is not a puzzle at all. Though intrinsic value is no criterion for a puzzle, the assured existence of a solution is.”¹⁰

The second consequence of the anecdote is that science may have moved in a governing position for knowledge but beyond its aura of almightiness we still discover with less pleasure the hesitant, the back and forth, the tentative approach characteristic for science, on the one hand, and the paramount importance of philosophical conceptualization, on the other. “Normal science is a highly determined activity, but it need not be entirely determined by rules. That is why, at the start of this essay, I introduced shared paradigms rather than shared rules, assumptions, and points of view as the source of coherence for normal research traditions. Rules, I suggest, derive from paradigms, but paradigms can guide research even in the absence of rules.”¹¹ Philosophy of science only strengthens the contributions of history of science in this respect.

Kuhn emphasizes this interplay between coherence and incoherence in terms of paradigms and rules in research traditions as a contribution of the history of science to philosophy of science, while, in fact, the latter is responsible for the conceptual substance of paradigms and the conceptualization of paradigm succession, as well as for the substance of the notions of coherence and incoherence in research endeavours.

The very logic of the scientific discovery represents a subject for philosophy of science rather than for the history of science (and, however limited and relativized the value of the former to the latter). In a critical approach to the Kuhnian idea of puzzles and *avant la lettre* similitude, we think, to Richard Rorty's mirror of nature, Karl Popper explains:

“Language analysts believe that there are no genuine philosophical problems, or that the problems of philosophy, if any, are problems of linguistic usage, or of the meaning of words. I, however, believe that there is at least one philosophical problem in which all thinking men are interested. It is the problem of cosmology: *the problem of understanding the world—including ourselves, and our knowledge, as part of the world*. All science is cosmology, I believe, and for me the interest of philosophy, no less than of science, lies solely in the contributions which it has made to it. For me, at any rate, both philosophy and science would lose all their attraction if they were to give up that pursuit. Admittedly, understanding the functions of our language is an important part of it; but explaining away our problems as merely linguistic ‘puzzles’ is not. Language analysts regard themselves as practitioners of a method peculiar to philosophy. I think they are wrong, for I believe in the following thesis. Philosophers are as free as others to use any method in searching for truth. *There is no method peculiar to philosophy.*”¹²

¹⁰ *Ibidem*, p. 36–37.

¹¹ *Ibidem*, p. 42.

¹² Karl Popper, *The Logic of Scientific Discovery*, London and New York, Routledge, 2002, pp. xviii–xix.

As already mentioned the analytic views of philosophy of science and history of science have in common the preoccupation for the growth of knowledge. The history of science offers no vision, no meta-interpretation, which could be relevant for a characterization of science and knowledge as well as for the *growth of knowledge* and would remain a chronicle of struggles and results if philosophy of science would not provide the frameworks of conceptualization and interpretation, however limited and relative (hence its value to the former). K. Popper shows:

“The central problem of epistemology has always been and still is the problem of the growth of knowledge. *And the growth of knowledge can be studied best by studying the growth of scientific knowledge.* I do not think that the study of the growth of knowledge can be replaced by the study of linguistic usages, or of language systems. And yet, I am quite ready to admit that there is a method which might be described as ‘the one method of philosophy’. But it is not characteristic of philosophy alone; it is, rather, the one method of all *rational discussion*, and therefore of the natural sciences as well as of philosophy. The method I have in mind is that of stating one’s problem clearly and of examining its various proposed solutions *critically*. I have italicized the words ‘*rational discussion*’ and ‘*critically*’ in order to stress that I equate the rational attitude and the critical attitude.”¹³

Karl Popper argues that philosophy of science contributes to the growth of knowledge and the history of science in a crucial manner via the concept and method of falsification. This sort of verification via falsification is a contribution of philosophy of science to history of science.

“The point is that, whenever we propose a solution to a problem, we ought to try as hard as we can to overthrow our solution, rather than defend it. Few of us, unfortunately, practice this precept; but other people, fortunately, will supply the criticism for us if we fail to supply it ourselves. Yet criticism will be fruitful only if we state our problem as clearly as we can and put our solution in a sufficiently definite form—a form in which it can be critically discussed. I do not deny that something which may be called ‘logical analysis’ can play a role in this process of clarifying and scrutinizing our problems and our proposed solutions; and I do not assert that the methods of ‘logical analysis’ or ‘language analysis’ are necessarily useless. My thesis is, rather, that these methods are far from being the only ones which a philosopher can use with advantage, and that they are in no way characteristic of philosophy. They are no more characteristic of philosophy than of any other scientific or rational inquiry.”¹⁴

With Popper, we come to realize that the growth of knowledge is a problem posed specifically by philosophy of science and by falsification philosophy of science contributed to a history of science “simplified” to the verified contributions to knowledge. Popper terms clearly the contribution of the philosophy of science to history of science:

“And although I believe that in the history of science it is always the theory and not the experiment, always the idea and not the observation, which opens up the way to new

¹³ *Ibidem*, p. xix.

¹⁴ *Ibidem*.

knowledge, I also believe that it is always the experiment which saves us from following a track that leads nowhere: which helps us out of the rut, and which challenges us to find a new way. Thus the degree of falsifiability or of simplicity of a theory enters into the appraisal of its corroboration. And this appraisal may be regarded as one of the logical relations between the theory and the accepted basic statements: as an appraisal that takes into consideration the severity of the tests to which the theory has been subjected.”¹⁵

Our observation concerning the reduction of history of science to verified knowledge results due to philosophy of science and falsification meets the observation made by Thomas Kuhn in appreciating history of science as the “chronicle of an incremental process”:

“In recent years, however, a few historians of science have been finding it more and more difficult to fulfil the functions that the concept of development-by-accumulation assigns to them. As chroniclers of an incremental process, they discover that additional research makes it harder, not easier, to answer questions like: When was oxygen discovered? Who first conceived of energy conservation? Increasingly, a few of them suspect that these are simply the wrong sorts of questions to ask. Perhaps science does not develop by the accumulation of individual discoveries and inventions. Simultaneously, these same historians confront growing difficulties in distinguishing the 'scientific' component of past observation and belief from what their predecessors had readily labelled 'error' and 'superstition'. The more carefully they study, say, Aristotelian dynamics, phlogistic chemistry, or caloric thermodynamics, the more certain they feel that those once current views of nature were, as a whole, neither less scientific nor more the product of human idiosyncrasy than those current today. If these out-of-date beliefs are to be called myths, then myths can be produced by the same sorts of methods and held for the same sorts of reasons that now lead to scientific knowledge. If, on the other hand, they are to be called science, then science has included bodies of belief quite incompatible with the ones we hold today. Given these alternatives, the historian must choose the latter.”¹⁶

Philosophy of science discusses and interprets in order to restore meaning for the selectivity of historical judgement. As Paul Hoyningen-Huene emphasized, philosophy of science brings to the fore also the expression “selectivity of historical judgment” and the philosophical elements involved by a criterion of comparative historical relevance.¹⁷ He discerns that in Kuhn’s case, the criterion directs historical research and presentation away from “Whiggish¹⁸” historiography by postulating a hermeneutic reading of historical sources. For P. Hoyningen-Huene, Whiggish is any form of historiography that

¹⁵ Karl Popper, *op. cit.*, p. 267.

¹⁶ Thomas Kuhn, *op. cit.*, p. 2.

¹⁷ Paul Hoyningen-Huene, “Philosophical elements in Thomas Kuhn’s Historiography of Science. *Theoria*, vol. 75, 2012, pp. 281–292.

¹⁸ It is Whiggish whatever is animated by a view that sees history on a path of inevitable progression and interprets the past in the light of the present.

assumes scientific progress.¹⁹ His argument explains that a postulate of hermeneutic reading for historical sources implies some sort of internalism, some sort of rationality of scientific development, and historical realism.²⁰ P. Hoyningen-Huene describes a portrait of Whiggish historiography and consequently a portrait of the contributions of philosophical principles to history of science grounded in Kuhnian ideas, although Hoyningen-Huene considered that Thomas Kuhn opposed to every entry of this matrix. Within this matrix history of science has ascribed a specific function, addressing the improvement of present science, insisting on the clarification of contemporary methods, notions and concepts²¹, it identifies the origins of contemporary science in the past²² (in the similar manner in which past science contains “the germs of present science” and it emphasizes “individual men of genius,”²³ while producing “hero-myths”²⁴).

There are other characteristics completing the above mentioned matrix: history of science describes historical episodes as stories that oppose the good and the bad, the progressive and the reactionary, “real” science and metaphysics²⁵, emphasizing the decisiveness of experiments in concluding the theoretical confrontations²⁶. In the perspective of Hoyningen-Huene²⁷, Whiggish historiography considers that there was only one Scientific Revolution characterized by the emergence of the Scientific Method²⁸, accompanied by dependent revolutionary episodes in the history of science²⁹, inducing a discontinuity³⁰. Instead, according to Hoyningen-Huene, Kuhn sustained that historiography should “display[ing] the historical integrity of [past] science in its own time”³¹.

¹⁹ Larry Laudan, *Science and Relativism: Some Key Controversies in the Philosophy of Science*, Chicago, University of Chicago Press, 1990, p. 56 after Paul Hoyningen-Huene, *op. cit.*, 2012.

²⁰ Paul Hoyningen-Huene, *op. cit.*, 2012.

²¹ *Ibidem*.

²² J. G. McEvoy, “Positivism, Whiggism, and the Chemical Revolution: A Study in the History of Chemistry”, *History of Science*, vol. 35, 1997, pp. 1–33 (4).

²³ *Ibidem*.

²⁴ J. R. G. Turner, “The history of science and the working scientist”, in R. C. Olby, G. N. Cantor, J. R. R. Christie, M. J. S. Hodge (eds.), *Companion to the History of Modern Science*, London, Routledge, 1990, pp. 23–31, esp. pp. 24–25 *apud* Hoyningen-Huene, *op. cit.*, 2012.

²⁵ J. G. McEvoy, *op. cit.*

²⁶ *Ibidem*, p. 23. Through decisive experiments history of science has the role to catalogue theories as either right or wrong, eliminating wrong theories from science, deemed a waste of time (cf. Turner, *op. cit.*, 1990, p. 23) and describing the “losers” in scientific controversy as “knives or fools” (Turner, *op. cit.*, 1990, p. 25). The image of scientific discovery is captured by the “eureka-moment version of scientific discovery” (McEvoy, *op. cit.*, p. 7), that is, discoveries are rather events than extended processes (cf. Kuhn, *op. cit.*, 1962). However, the conception of scientific development tends to remain cumulative (McEvoy, *op. cit.*, p. 6).

²⁷ Paul Hoyningen-Huene, *op. cit.*, p. 285.

²⁸ J. G. McEvoy, *op. cit.*, p. 23.

²⁹ *Ibidem*, pp. 10, 15.

³⁰ *Ibidem*, p. 23.

³¹ Paul Hoyningen-Huene, *op. cit.*, p. 285.

We notice that selectivity of historical judgement is another version of the Rortian criticism concerning mirroring and the absolute and compulsory orientation of the growth of knowledge towards “progress” and towards the hermeneutics proposed: a highlight of the role of proper interpretation (concerned with contextualization of knowledge in its own time etc.).

Conclusions

History of science functions as “treasure chest”, a data basis, providing illustration and either bodies of proof or counter-examples, accordingly to the case, for the perspectives, conceptualizations and theories sustained by the philosophy of science. Philosophical conceptualization is the first contribution of philosophy of science: the hypothesis or the theory to be tested and then the reflection on conclusions are philosophical. History does not interpret the results of science, or those of thought, it does not initiate (hypotheses or theories of) knowledge. History of science registers the all the timely results of thought and science as knowledge.

The interpretation of the results in the light of other results and the idea of incommensurable results are philosophical. Philosophy of science interprets the scientific endeavours and defines what knowledge is, while the history of science records the contributions to knowledge agreed upon and validated at a certain time. The former contributes to the latter with the definition and redefinition of its object of study. The latter contributes to the former with data and narratives of scientific discovery and scientific growth. As scientific knowledge is always timely and not the limit of what we can possibly know there is no limit to the history of science or, for that matter, to philosophy of science and the new perspectives over knowledge and discovery.

Philosophy of science brings new data into the history of science table of contents which often act as a catalyst for new interpretations, for new ramifications and these, in turn create a special horizon, furthering interpretations. For instance, conceiving a distinction in the understanding of science as activity and science as result (to be developed in a future study or essay) is to discuss also the distinction stating that science as activity is rather interesting for philosophy of science and science as result is rather interesting for the history of science, although any result has a certain relevance for the philosophy of science, too.

History of science may emphasize methodological narratives and their periods of hegemony. From a Kuhnian point of view, as well as from that defended by Hoyningen-Huene, the value of history of science to philosophy of science is situated in the philosophical principles emphasized historically as avenues to success. Such principles enable novel interpretations leading to either paradigmatic identity of knowledge or to its revolutionary change, which enrich historiography and nuance a certain hermeneutics of knowledge, through philosophical perspectives (such as the important role played by incommensurability in assessing bodies of knowledge). From a Popperian point of view, the value of philosophy of science to history of science is generated by the insights offered on the growth of knowledge. Philosophy of science decides on the degree of falsifiability or of simplicity of a theory and on the consequential simplification of the

history of science reduced to verified results. From a Rortian point of view, the value of history of science to philosophy of science is to suggest the relativization of the ideas of objective truth and progress. Philosophy capitalizes upon these hints and the rejects of mirroring of nature by the human mind. The blinking Eye of Mind surprises the limits of objectivity, truth and progress as constructs in science assessment. Interpretation, conceptualization and the limits of the hierarchies of “progress” (and of the hierarchies of order) are the value of philosophy of science to the history of science.

History of science is the mnemonic support for a relevant thought in philosophy of science. Concepts such as coherence, justification, foundationalism, and even knowledge in contemporary philosophy can only improve the quality of “hermeneutics” developed via philosophy of science, to a certain extent inducing an interest for a diversification of the history of science as history of thought on knowledge, as history of thought concerning coherentism, or justification or foundationalism etc.

The scientifically relevant role of philosophy meets the scientific need for conceptualization, identification, expression and communication of regularities. In a way, the quality of conceptualization describes the quality of the definitional and methodological design (including here the influence of conceptualization on the quality of the hypotheses) of a scientific endeavour. The object of philosophy of science is elaborating theories that provide scientific understanding of the genus of knowledge beyond the species of scientific theories and thought results. The object of philosophy of science lies beyond the regularities observable in nature, beyond the assessment of the immutable principles and its scope is mapped by the awareness of the plurality of modes of description, of hermeneutic possibilities.

History of science contributed to philosophy of science with the experiential wisdom, with a database of validated results offering a certain perspective. We are saying also that philosophy of science contributed to history of science imposing the importance of meaning, the importance of conceptualization, and the importance of hermeneutics, this way offering the possibility to set things in a more complex perspective, nuancing and even refusing the perspectives brought about by the hegemonic and absolutist notions of *truth* and *progress*.

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