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EPISTEMOLOGY AND HISTORY OF SCIENCE IN THE REFLECTIONS OF EVANDRO AGAZZI

Abstract

The merit of Evandro Agazzi's epistemological reflection can be found in the following proposal: the history of science should be understood and studied as a meeting point between philosophical reflection and scientific research. Science and philosophy are thus closely united. In the words of Kant, science without philosophy is blind and philosophy without science is empty. Not only that: for Agazzi, the philosophy of science helps society as a whole to better understand the cultural (and human) value of science. Conversely, the history of science helps us to understand the perennially progressive nature of our knowledge. Why is this so? Because we can never disregard the intrinsic historicity of scientific knowledge.

The historical approach to science also helps us to understand how scientific development always takes place within different choices. Conversely, epistemological reflection also helps historical research to better understand the development of our cognitive and technical heritage. On this basis, Agazzi worked - in collaboration with Ludovico Geymonat - to spread the institutional presence of the philosophy of science and the history of science (as well as mathematical logic) in universities, especially in Italy. Today, all of us are like dwarfs on the shoulders of giants, since we can better understand the connections between science and philosophy precisely because we can avail ourselves of Evandro Agazzi's historical contributions.

Keywords: Philosophy of science; history of science; epistemology; historicity of knowledge; philosophical understanding of science

ERKENNTNISTHEORIE UND WISSENSCHAFTSGESCHICHTE IN DEN ÜBERLEGUNGEN VON EVANDRO AGAZZI

Zusammenfassung

Das Verdienst der erkenntnistheoretischen Überlegungen von Evandro Agazzi besteht in folgendem Vorschlag: Die Wissenschaftsgeschichte sollte als Treffpunkt zwischen philosophischer Reflexion und wissenschaftlicher Forschung verstanden und untersucht werden. Wissenschaft und Philosophie sind damit eng miteinander verbunden. Mit den Worten Kants, ist Wissenschaft ohne Philosophie blind und Philosophie ohne Wissenschaft leer. Und nicht nur das: Für Agazzi hilft die Wissenschaftsphilosophie der Gesellschaft als Ganzes, den kulturellen (und menschlichen) Wert der Wissenschaft besser zu verstehen. Umgekehrt hilft uns die Wissenschaftsgeschichte, den immerwährenden Fortschritt unseres Wissens zu verstehen. Warum ist das so? Weil wir die progressive Natur unserer wissenschaftlichen Erkenntnisse nicht außer Acht lassen dürfen.

Der wissenschaftsgeschichtliche Ansatz hilft uns auch zu verstehen, dass die wissenschaftliche Entwicklung immer im Rahmen verschiedener Entscheidungen stattfindet. Umgekehrt hilft die erkenntnistheoretische Reflexion auch der historischen Forschung, die Entwicklung unseres kognitiven und technischen Erbes besser zu verstehen. Auf dieser Grundlage setzte sich Agazzi – in Zusammenarbeit mit Ludovico Geymonat – für die Verbreitung der institutionellen Präsenz der Wissenschaftsphilosophie und der Wissenschaftsgeschichte (sowie der mathematischen Logik) an den Universitäten ein, insbesondere in Italien. Heute stehen wir alle wie Zwerge auf den Schultern von Riesen, denn wir können die Zusammenhänge zwischen Wissenschaft und Philosophie besser verstehen, gerade weil wir auf die historischen Beiträge von Evandro Agazzi zurückgreifen können.

Schlüsselwörter: Wissenschaftstheorie; Wissenschaftsgeschichte; Erkenntnistheorie; Historizität des Wissens; Philosophisches Wissenschaftsverständnis

On the occasion of the conference on *Methodological Problems in the History of Science* promoted by the *Center for Methodological Studies* of Turin on March 29-31, 1967 (the proceedings of which were later included in the *Domus Galileiana* publications on the history of science), Evandro Agazzi spoke with his reflection on *The History of Science as a meeting point between philosophical reflection and scientific research*¹. In this contribution

¹ G. Barbèra Editore, Florence 1967, pp. 39-59. The following quotations in the text are taken, respectively, from the following pages: p. 42; p. 46; p. 48; p. 56 (italics in the text); p. 57 (italics in the text); p. 49; p. 50; pp. 58-59; p. 59.

of his, recognizing the fundamental role that philosophy always plays in every different historical epoch, precisely because it constitutes the deepest critical awareness of that particular society and its cognitive heritage, allowing us, thus, to critically penetrate the soul of every culture and historical society, Agazzi makes considerations, of a theoretical order, to illustrate how precisely a humanistic discipline such as the history of science, in intelligent alliance with the philosophy of science, can be the privileged place to better enhance the sciences in the contemporary world, allowing the latter to also understand the precise cultural value of the scientific enterprise and its research. In this perspective, the history of science can then take on a truly strategic cultural significance, because it can contribute to overcoming the very opposition that in the modern age took shape between the so-called “two cultures,” the scientific and the humanistic.

In Agazzi’s consideration, philosophy of science and history of science cannot but continually intertwine, while recognizing each of these disciplines as having its own specific disciplinary autonomy. In fact, in the first place, Agazzi recognizes how philosophy of science plays an irreplaceable role in enabling us to understand and bring into full view the noetic structure of science. Which also helps to understand the specific problem in which contemporary science has been struggling for some years. Indeed, during the twentieth century, there has been a kind of explosion of knowledge, which has been accompanied, however, by a kind of overt poverty of new scientific “ideas.” Reflection on the specific noetic structures of science could thus help the militant scientists themselves to better understand the overall nature of the theories they also use in their research, by becoming critically aware of the imbalance in contemporary scientific culture “between the endless accumulation of our ‘knowledge’ and the paucity of ‘ideas’ and orientations with which to enhance them.” In Agazzi’s opinion, this imbalance is in significant part also caused by a diminished interest of twentieth-century scientists in epistemological investigations, in contrast to what was generally the case during the nineteenth century, a time when many scientists were themselves excellent epistemologists. To the point that - Agazzi writes again - “one is certainly not being naive, in fact, if one says that the writings between the philosophical and the popular of men, albeit very great on the level of science, such as Einstein or Heisenberg, do not bear comparison, in terms of vigor of speculation and force of problematization, with those, for example, of Helmholtz, Mach, Cantor, Frege, Poincaré or other scientists of the albeit recent past. This confirms precisely what was asserted above,

namely, that not only has culture become too detached from science, but that science has also become too disabused of speaking the language of culture.” It is, therefore, necessary to seriously reconsider the role and function of the philosophy of science within our culture, keeping in mind how precisely epistemological reflection can be a

...privileged vehicle (not the only one, by the way) through which science can make its voice heard within culture, enabling it to be enriched by the fruits of the great “intellectual experience” represented by scientific knowledge. At the same time, by this same route the fruits of the work of conceptual clarification, the need for awareness, the taste for synthesis, the sense of general problems, which characterize speculative culture, flow back to science, and this, even if it should not directly affect the immediate “progress” of science, undoubtedly has the important effect of making it take on an awareness of its cultural dignity, of its value as well as its “humanistic” value, and, above all, it would also help scientists to a type of discourse that is certainly not the specialized one of their branch of research, but which on the other hand is precisely what they must be able to hold if they want to interject themselves into the great issues of the civilization of our time and make their voices heard in them.

Not only that: in Agazzi’s opinion, it is also necessary to keep in mind how the philosophy of science can help the entire civil society to better understand the many fundamental human values of science, highlighting precisely the sense of objectivity, the attitude of intellectual honesty, the spirit of disinterested collaboration, intersubjective communication, critical caution and a tendentially antidogmatic attitude that, at least ideally, should always animate and characterize the scientific enterprise (at least in its ideal and programmatic ends). The valorization of these axiological factors present within science would thus also help to bring science closer to civil society as a whole.

On the other hand, if this is the positive contribution that can be made by the philosophy of science, neither should we overlook the different but equally positive contribution that the history of science can also make for the purposes of fostering a more positive and fruitful osmosis between scientific and humanistic cultures. From this point of view, it is necessary to keep in mind how in the cultural tradition of the twentieth century (especially in the Italian one) there is a marked historical sensitivity. Therefore, in the light of the presence of this widespread historical sensibility, it should then be easier to be able to emphasize the fundamental role that the history of science can exercise precisely in the sense of accustoming us to keep in mind the historical awareness that distinguishes each different society:

“once again, therefore (and it is worth noting this explicitly), the fundamental motivation in favor of an adequate knowledge of the history of science turns out to be of a bluntly “humanistic” character: it is in order to understand adequately, without mutilation and without misunderstanding, the true face of the civilization of an era, that one understands one cannot ignore the scientific component of its culture.” Along this ridge, the history of science can also exert its valuable educational role, helping the educated man, as well as the scientist himself, to realize “the indispensable complementarity of the two humanistic and scientific moments in order to ‘understand’ the civilizations of the past,” in order “to be able to appreciate the validity of the reciprocal relationships established between science and culture,” in order to revive and reconstruct these same relationships within our contemporary culture.

Certainly, for Agazzi, it is always necessary to keep in mind that the history of science constitutes, by its very essence, a fully humanistic discipline that should precisely be counted within the historical disciplines, even if then this field of research possesses its own undeniable disciplinary specificity. A disciplinary specificity that allows us to understand its positive function, because the history of science also constitutes a valuable “hinge” between humanistic culture and scientific culture. Of course, like all historical disciplines, the history of science should not aim to elaborate a “judgment on history,” because it should, if anything, help us to elaborate a better “understanding *of* history.” However, it is precisely the awareness of the existence of an “accentuatedly historicist imprint that characterizes our age and the more or less accentuated historicist imprint that marks our culture” that should not lead us to limit the role of the history of science to the “understanding *in* history” of the different manifestations of human civilization, because the need to be able to put head, precisely thanks to historical investigations, to an “understanding *in* history” of the different aspects of human civilization should also be affirmed in parallel. On this ground, “the history of science can offer a particularly clear paradigm of how this understanding *of* history can take place in a way that is not pretentious, but objective, controllable, rigorously grounded and scientifically correct.”

On the other hand, precisely on this terrain of historical inquiry posed by the history of science, the philosophy of science can also play a valuable role, at least insofar as, Agazzi observes, “it is only a philosophical understanding that makes it possible to place the ‘news’ relating to the technical progress of the various sciences in a ‘story’ that illuminates the more general

meaning of their becoming.” Thus, if the historian of science has a duty to master even from a “technical” scientific point of view the topics he or she deals with, on the other hand it is also true that the precise cultural and scientific significance of these same “techniques” can only be made explicit by placing them on a broader and more articulate horizon of philosophical understanding. Not least because, Agazzi adds, “it cannot be forgotten that the very history of the technical advances of a discipline is bound to remain full of unresolved questions and runs the risk of incurring authentic distortions of perspective if one does not have in mind cultural situations, influences of ideas, prejudices that endure or fall, only by taking into account which one can understand the reasons for certain delays or certain sudden revivals, certain set-asides, misunderstandings or overestimations and so on.”

In light of the above considerations, it then becomes possible to better understand the role of authentic “hinge” that the history of science, intertwined with the philosophy of science, can exercise within the nexus of science and culture, claiming, moreover, its full disciplinary and cultural autonomy. For Agazzi, in fact, the history of science

...truly stands at the crossroads of the two [cultures] or, if we prefer, is one of the areas of “culture” in which interest is most vividly revealed and contact with science is most direct; at the same time, precisely because its development also requires a non-superficial knowledge and mastery of scientific techniques, it is also a privileged forum in which science can recognize itself, can hear its own true voice and at the same time witness, as it were, the insertion of it into the concert of the other voices of culture, on the strength of those conceptual links, those noetic structures, those problems of a broader order which, brought out explicitly by the philosophy of science and detected by the historian with epistemological sensitivity, can succeed for the scientist himself of a certain novelty and in any case of great interest.

From this point of view, Agazzi can then emphasize how the history of science can be a fruitful privileged ground for the encounter between philosophical reflection and scientific research itself. Indeed, from his point of view, philosophy of science and history of science

...do not straddle two sciences, but even two orders of research, two types of mentality in that, while on the one hand they present themselves as “specializations” of philosophy and history, that is, of two of the most distinguished and traditional branches of “humanistic” culture, on the other hand they have deep roots and imply a first-hand engagement in the cognitive domain of authentic “scientific” research. The juxtaposition of culture and the sciences is thus made possible in the first place by the work of understanding the cultural

valences of science carried out at the epistemological level, at the level of theory and conceptualization; the history of science, then, when illuminated by these epistemological understandings, makes it possible to “concretize,” to trace, carried out in the events of the past, the lines of this juxtaposition and thus to propose them also to the eyes of today’s culture with the evidence of “fact” and the persuasiveness of an enterprise that, precisely because it shows its success in the context of reflection on the past events of civilization, reveals more of its fruitfulness and plausibility for the present as well.

According to Agazzi’s reasoning, philosophy of science and history of science thus constitute two specialized humanities disciplines that, by their intrinsic nature, configure a different, but intertwined, interconnected, and very fruitful, field of research, within which the “two cultures” are naturally placed in direct relation and almost continuous connection. These two disciplines therefore have before their horizon of inquiry at least a twofold scenario. In a first case, they may in fact enclose themselves, more or less blindly, in their own, moreover inalienable, sectorial specialization, with the consequence of ending up by configuring themselves solely according to a very technical and prejudicially circumscribed mode that would prevent them precisely from dialoguing and confronting with other disciplines, taking advantage of that culturally privileged position that they also possess. In this hypothesis, these disciplines would in fact only follow a model of hyper-specialization, the one already cultivated and made their own by the different branches of the most advanced scientific research and, in this way, would only contribute to reinforcing a capital problem of contemporary culture, namely that of a specialization that no longer knows how to get out of the little garden it has built for itself. Certainly, a culture that is adequate to the contemporary techno-knowledge heritage and therefore worthy of the name can no longer, of course, renounce the most sophisticated and technical specialization, but which, precisely because of this, also often and willingly ends up no longer being able to understand the overall nature of this same techno-knowledge heritage.

Or, these two disciplines, adopting a second and different option, can instead configure themselves as the privileged ground in order to foster a better understanding of the cultural, intrinsic value of science, its history, and also its more technical and more peculiar aspects. According to this second direction, the philosophy of science and the history of science certainly do not have to give up their peculiar disciplinary specialization, but they can and must achieve it without, however, ever losing sight of their own specific interweaving, since it is precisely this fundamental osmosis between the

philosophy of science and the history of science that allows them to better communicate the precise and more articulate meaning of their specialized research. And they succeed in achieving this important result at the very moment in which they are precisely able to effectively build a strategically significant bridge between the “two cultures,” thanks to which our entire contemporary culture cannot but benefit overall, both on the level of its epistemological awareness and on that of its historical awareness.

Returning, in 1975, to the nexus between *Epistemology and the history of science*², Agazzi thus reaffirmed and clarified how in his perception of this relationship, the philosophy of science can only be configured as an indispensable component for the history of science and how, conversely, epistemology, in turn, can no longer develop its reflection apart from a timely consideration of the history of science either.

The root of this double entanglement is, moreover, traceable precisely in the consideration that science itself constitutes an indisputable historical fact. A historical fact that can and must be investigated and studied as much by paying attention to the “internal history” of science as to its “external history.” In fact, even in this case, one should not set the former against the latter or, vice versa, the latter against the former, because, if anything, one should instead emphasize the complementarity of both of these two different perspectives, the deepening of which allows us to better understand precisely science itself in its historical evolution and in its having been constructed within different historical societies. If anything, as Agazzi writes, we must always keep in mind the following underlying relief: “if the character of historicity is inherent in such a profound and substantial way in science, then any discourse that aims at better understanding and deepening the nature of the latter cannot ignore such a character at all, which is to say that a nontrivial consideration of the historicity of science is necessarily part of any epistemology and, insofar as this historicity is made clear by a work of actual historical research, it must also be concluded that the history of science fits in as a necessary (i.e., not accidental, not merely illustrative or illustrative) component of epistemology.” On the other hand, precisely this nexus that powerfully intertwines epistemology and the history of science

² Published in *La storiografia della scienza: metodi e prospettive*, Domus Galileiana, Pisa 1975, pp. 11-32. Agazzi's earlier, albeit shorter, contribution should also be noted, *Valore epistemologico della storia della scienza*, “Civiltà delle macchine”, I, 1970, pp. 55-58. The quotations that follow in the text are all taken from *Epistemologia e storia della scienza*, from the following pages: pp. 16-17; p. 19; p. 23; p. 26.

possesses its own intrinsic value that is inalienable even for the militant scientist himself who, if he really wants to understand the discipline he is dealing with, cannot avoid asking himself as much epistemological questions as questions inherent in the very history of his privileged subject of study.

So here we come to the point: either the scientist believes that he can do his science even without knowing well what this science of his is, or he believes that in order to do so he must also understand, with some depth, what it is. In this second case, which we believe is actually the most heartfelt even apart from its obvious theoretical superiority, it comes to be admitted that to doing science a certain measure of epistemological understanding is necessary and therefore, within this, also a certain measure of historical awareness, for the reasons already made clear.

Historical reflection and epistemological reflection, moreover, benefit the very clarification of science and thus constitute two moments-which, moreover, also turn out to be closely intertwined-which the militant scientist himself cannot renounce precisely because “the theoretical commitment to affirming a proposition calls for historical commitment.” Those who harbor doubts in this regard would, moreover, have no choice but to refer to the timely historical-critical examinations put in place by Ernst Mach with his famous studies on classical Newtonian mechanics. Indeed, it was these studies of his that enabled a better understanding of the values and limits of classical mechanics, opening a horizon of reflection within which the Einstein revolution itself later matured and grew. In this perspective, “historical reconnaissance thus appears as the most concrete way to see how what is being established can sustain itself, that is, how it better solves problems already posed and solved by other means, how it meets difficulties previously not addressed due to lack of technical or conceptual tools, how it knows how to deal with new problems, and so on.” Nor, finally, can it be left unsaid how the historicization of scientific categories operated by the historical study of science also has the merit of highlighting the “contingency” of the noetic structures of scientific knowledge:

The history of science, that is, shows how its becoming is full of choices. For each science it is possible to see that it has had a certain direction, overall, only because, at given moments in its history, certain choices have been made, to the exclusion of certain other possibilities.

Finally, reversing our theoretical hourglass, the inverse relationship also applies, since epistemological reflection also greatly benefits the same

historical research put in place by the history of science. In Agazzi's words again:

In other words: it is not possible to do a true history of science without a philosophical interpretation of science itself, because that would be wanting to do the history of science without delving into what science is. Round and round, we are always at the problem of knowing adequately what history is being made of. This entails, as mentioned earlier, a knowing the content, technical aspect of the sciences of which one makes history, but this is not enough: if a science is made up not only of content but also of structures, categorizations, conceptual framings, if its evolution is almost always linked to the evolution of these structures, even more than to the evolution of content, then an ability to master this structural evolution is indispensable for making history of science.

Finally, it is interesting to keep in mind how Agazzi then concretely set up the study of the history of science by preparing, coordinating and partly writing his *History of Science*, which appeared at Città Nuova Editrice in two volumes in 1984, making use of the collaboration of different specialists³. In this work dedicated, significantly, not to “science” but to a “history of science”-Agazzi naturally had to address the problem of what the meaning of a history of science might be in contemporary culture. Not only that, he also had to clarify the related question of how a history of science can be understood and constructed today. Agazzi discards a perspective based on the passive recording of the progress of the history of science since it seems to him that limiting oneself “to the reconnaissance of what, in the various epochs, has been classified as ‘science’ by contemporaries” presents an intrinsic flaw, namely that of delineating “a history of the *term* ‘science,’ precisely because through the ages it has served to designate very different cognitive (and even not strictly cognitive) contents.” But if it is therefore not by appealing to the dictionary and its terminological definitions that one can understand how to proceed, then what? By adopting perhaps the Veblenian suggestion made his own by Ludovico Geymonat in his great *Storia del pensiero filosofico e scientifico*? Or by considering the topics by which each conceptual tradition has built itself up within the dialectic between continuity and discontinuity as suggested by Preti in his eminent *Saggi filosofici*? Agazzi adheres neither to the Geymonatian nor to the Pretian solution (which,

³ *Storia delle scienze*, edited by Evandro Agazzi, Città Nuova Editrice, Roma 1984, 2 voll. All quotations that follow in the text are taken from Agazzi's *Introduction*, which can be found in vol. I, pp. 8-14, in particular, the quotations can be found on p. 8, c.2, p. 9, c. 2, and p. 10, c. 1.

moreover, he does not even directly consider) but instead proposes to follow a suggestion that goes back to Benedetto Croce:

...the most reasonable course to follow appears to be that suggested by the wise application of a maxim which, albeit with a somewhat different meaning, was enunciated by Benedetto Croce, when he observed that “history is always contemporary history.” In our case, its application consists in realizing that, when we want to make history of science (but not only of it), we cannot help but have in mind a certain paradigm, a certain model of it, which is constructed precisely by what science is for us today. It is on that basis of contemporaneity that we form the concept of that specific component of human civilization, and it is then on the basis of that concept that we can set about reconstructing the forms it has taken in past ages. There is nothing scandalous or naïve about this: it would be naïve, however, not to understand that the historiography of science is also a “historical fact” and that, therefore, each epoch conducts it in accordance with its own ways of conceiving both science, history (i.e., the course of historical events), and historiography (i.e., the way history is told). Therefore, in doing history of science one will be guided substantially by the most commonly accepted ‘criteria of scientificity’ in one’s historical epoch and likewise by the inventory of ‘scientific’ disciplines that one’s epoch is willing to admit as such.

Of course, Agazzi does not deny the dangers present in such a way of proceeding, which should precisely always be applied in a very “wise” way, thus avoiding mere “translations” (exposing, for example, the results of a past science with the knowledge and technical language of contemporary sciences). Such a way of proceeding would in fact make us nullify the very intrinsic historical value of those same results, flattening them within a horizon - that of contemporaneity - which would end up constituting the most drastic and radical denial of the historicity of science. It is therefore necessary to always keep at bay, critically, these possible hesitant outcomes for any scientific research. On the other hand, the Croce-inspired methodological approach suggested by Agazzi also has, in his view, an undoubted merit, namely, that of making it fully clear that one cannot - and should not - fall into the absurdity of defending a “method of ‘total historicization’ and integral science. Indeed, one cannot critically understand a given historical epoch “using in all and for all and exclusively, what happened or is present in it.” The Crocian methodological suggestion precisely allows us to keep in mind how in the history of science not everything is reducible to historicity itself precisely because there is always “something” from a given historical epoch that “endures even in our own.” It is precisely this perpetuation of

it that eludes an integral historicization which then implies that “we can write history since *not everything* is historically determined, since there are certain supra-historical elements which, present even in our own time, offer us the possibility of following them as guides for reading the past and also of understanding what different collocations and functions they might have received in that past.” In this hermeneutic key, then precisely the knowledge of contemporary science constitutes a valuable aid precisely to better understand the science of the past. This allows then to reconsider and use, always with due critical awareness, even the traditional concept of “scientific progress.” Indeed, without falling into an “oversimplifying image of this as ‘linear progress’” one can, however, recognize how humanity’s cognitive heritage is also characterized by permanent acquisitions of knowledge. “In other words: no history is given unless we show how from a certain stage the next stage emerged and how today is the posterity of yesterday. This also applies to the history of science.”

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