May the reinforcement be with you: On the reconstruction of scientific episodes

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At least since Kuhn, there is a common agreement in the philosophy of science about the importance of the relationship between history and philosophy. However, it has been recently argued that the integration between philosophy and history of science is not as successful as we tend to imagine because, as a matter of fact, the bridge between them is so diffuse and narrow that prevents us from sharply transmitting information from one side to the other (cf. Schickore 2011). It has also been suggested that philosophy of science tends to employ empirical data in order to support particular philosophical theses, instead of trying to use them as an orientation to build more accurate descriptions and explanations for actual scientific phenomena (cf. Vickers 2013). The problem emerges very easily then: If all these critiques are right, philosophers of science seldom tell us anything about actual science, and history is not filling up philosophy, as it is expected to happen.

How can we make things right –that is, using history of science appropriately as a source of philosophical considerations about science, not as mere testing of philosophical theses largely independent of actual history– without losing a considerable amount of our philosophical achievements regarding the understanding of science? In what follows we will try to answer only one particular segment of that question. We will focus exclusively on the relationship between history and philosophy of science in reconstructing particular scientific episodes, and we will ask ourselves how we can make things right when evaluating both particular historical reconstructions and their respective philosophical interpretations.

Like theories, reconstructions of episodes in the history of science can possess (or lack) certain virtues such that, when we face two different reconstructions of the same episode, we should choose the most virtuous one. However, we will argue that when afore dissimilar reconstructions of the same episode, it is not always necessary telling the 'good ones' from the 'wrong ones', and that, as a matter of fact, each reconstruction could provide different but perhaps equally relevant data about the episode in particular, science in general, and also for particular philosophical theses.

In order to do so we will proceed in three steps:

- First, we will argue that a reconstruction of scientific episode has the main purpose of increasing our knowledge, although not only about the reconstruction's object of study, but perhaps also about a particular case study, a specific scientific context, or even about science itself. Moreover, and perhaps as important as the above, reconstructions might *reinforce* philosophical theses, whether *strongly*, as in providing a rationale for them, or *weakly*, that is, reconstructions increase our knowledge of philosophical theses not necessarily by supporting them, but by enhancing our understanding of them in, say, clarifying some of their concepts or their applications. (See Laudan 1977 and Elsamahi 2005 for related notions of reinforcement.)
- Second, we will stress that reconstructions are not mere theories, and thus might be evaluated according not only to its possession or lack of some epistemic values (such as

simplicity, scope, fruitfulness, consistency, among others), but of some methodological virtues (such as historical relevance, historical accuracy, normative accuracy, among others) as well. Thus, we aim at asking questions like *Under what circumstances and for what purposes a reconstruction could be better than other?* instead of asking questions like *What makes a reconstruction of a scientific episode the best one?*

- Finally, we present a particular case study which illustrates the above. During the 18th century, the theory of Spontaneous Generation (Heterogenesis) and the theory of Biogenesis contended to explain the origin of life. Nevertheless, the latter failed the tests to prove that parasitic worms were generated by biogenesis, yet it was possible to predict and explain their appearance through the theory of Heterogenesis. This episode has been reconstructed in two different ways. On the one hand, it has been seen as a case of inconsistency toleration in science. It has been said that for over a century, scientists had to use both theories in explaining the origin of living entities in order to solve relevant problems in biology and parasitology (see Farley 1972, 1979, 1989). On the other hand, it has been argued that this is rather a clear example of scientific growth (in a Lakatosian sense) were the theory that ended up being the established one was that that since the beginning achieved, despite its incompleteness, a set of specific epistemic values. In this sense, it has been said that scientists were always confident about Biogenesis, appealing to its simplicity and fruitfulness, and that they were only waiting for the development of the necessary experimental instruments in order to show how the theory could explain the origin of parasitic worms.

This case study shows how two very different reconstructions of a particular scientific episode can help us to increase our knowledge about science. The first one give us a picture perhaps less historically accurate but which expands the possibilities for theories' dynamics, while the second one give us a picture of scientific growth leaded by specific epistemic values in which historical accuracy plays a major role. Nonetheless, although each scores better in different sets of values, and perhaps because of that, both reconstructions increase our knowledge about science in general.

But in reconstructing certain episodes as cases of inconsistency toleration one may also (weakly) reinforce some paraconsistent theses regarding science. For example, how inconsistency does not always mean disaster, how inconsistency could be avoided by isolating consistent chunks (Brown and Priest 2004), how inconsistency could be avoided by weakening the epistemic commitments (Davey 2014), or how, when talking about relevant inconsistency between theories, one can claim that inconsistency is tolerated if and only if one can show an empirical domain that, in order to be explained, requires the conjunction of contradictory theses.

Basic references

ARONSTEIN, L. (2013): *Parasitic Worms: Their Role in Medicine and Science in Modern Europe*, BA project, Oregon State University.

BROWN, B. (1990): "How to be realistic about inconsistency in science", *Studies in History and Philosophy of Science* 21 (2), pp. 281-294.

BROWN, B. and G. PRIEST (2004): "Chunk and permeate. A paraconsistent inference strategy. Part I: The infinitesimal calculus", *Journal of Philosophical Logic* 33: pp.379–388.

DAVEY, K. (2014): "Can good science be logically inconsistent?", *Synthese* (*Is Science Inconsistent?* Special Issue) 191: 3009-3026.

ELSAMAHI M. (2005), "Coherence between theories", *Canadian Journal of Philosophy* 35(2): 331-352.

FARLEY, J. (1972): "The spontaneous generation controversy (1700–1860): The origin of parasitic worms", *Journal of the History of Biology* 5 (1), pp. 95-125.

---------- (1979): "The spontaneous generation controversy (1859–1880): British and German reactions to the problem of abiogenesis", *Journal of the History of Biology*, 5 (2), pp. 285-319.

---------- (1989): "Parasites and the Germ Theory of Disease", *The Milbank Quarterly* 67, Supplement 1. Framing Disease: The Creation and Negotiation of Explanatory Schemes, pp. 50-68.

LAKATOS, I. (1970): "History of science and its rational reconstructions", *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*, Vol. 1970, pp. 91-136.

LAUDAN, L. (1977): *Progress and its Problems: Towards a Theory of Scientific Growth*, University of California Press.

NICKLES, T. (1986): "Remarks on the use of history as evidence", *Synthese* 69 (*Testing Theories Of Scientific Change* Special Issue) 69 (2): pp. 253-266.

PRIEST, G. (2002): "Inconsistency and the empirical sciences", in Joke Meheus (ed.), *Inconsistency in Science*, Kluwer Academic Publishers, pp. 119-128.

SCHICKORE, J. (2011): "More thoughts on HPS: Another 20 Years Later", *Perspectives on Science* 19 (4), pp. 453-481.

VICKERS, P. (2013): *Understanding Inconsistent Science*, Oxford University Press.