

Critical Notice

Scientific Realism: How Science Tracks the Truth. STATHIS PSILLOS. London and New York; Routledge, 1999. Pp. xxv + 341.

This is an admirable book, and is essential reading for all students of scientific realism. It reviews and evaluates nearly all of the important arguments for scientific realism in the literature, and does so fairly, lucidly, and thoroughly. But it has one major defect: one that it shares with most other justifications for scientific realism. It presents the case for realism as a two-stage argument from the empirical success of science, to the truth, or approximate truth, of its dominant theories, to the reality of the things and processes that these theories appear to describe. Formally the argument is sound, given that one has an adequate metaphysical (i.e. correspondence) theory of truth to back it up. But no such theory of truth is developed, and one is left in the dark about what ontology is implied by the truth, or approximate truth, of the well-established scientific theories.

The following statements are all undoubtedly true, or approximately true:

- (a) $7 + 5 = 12$
- (b) It is impossible to produce a perpetual motion machine of the second kind
- (c) Every body attracts every other body in the universe with a force that is inversely proportional to the square of the distance between them
- (d) If this match were struck in a dry atmosphere it would light
- (e) The laws of nature are the same with respect to all inertial systems.

Philosophers are likely to agree that these statements are all at least approximately true, whatever their theory of truth may be. But they all present difficulties for the correspondence theory of truth. What are the facts corresponding to these various true propositions, and what ontology is required to accommodate them?

Psillos's account, like so many others, leaves such questions as these unanswered. For he seems to think that the principal worry for scientific realists is the question of truth. Certainly the main challenge to scientific realism has come from this direction. But, it seems to me that even if the question of truth could be settled decisively in favour of scientific realism, the ontological question would remain. The correspondence theory of truth is far too weak and indecisive to carry the metaphysical burden of the argument for scientific realism.

Psillos correctly characterises scientific realism as a comprehensive philosophical stance involving a metaphysical, a semantic and an epistemic thesis. The metaphysical thesis is that the world has 'a definite and mind-independent natural kind structure.' The semantic thesis involves taking scientific theories 'at face value', 'seeing them as truth-conditioned descriptions of their intended domain, both observable and unobservable', and hence as 'capable of being true or false'. The epistemic thesis is that 'mature, predictively successful scientific theories' are to be regarded as 'well-confirmed and approximately true of the world.'

The first of these three theses is the most important since it is proposed as the metaphysical foundation for scientific realism. Such a metaphysical foundation is

required, Psillos argues, because, unless one accepts that there is a natural kind structure of reality, one cannot even get to first base with scientific realism. If reality does not have such a structure, then there are no real properties or kinds, and hence our classifications of things cannot correspond to reality. They may be more or less useful, and the theories we develop on their basis may be more or less satisfying, but they cannot be said to be objectively correct.

Psillos develops his case for accepting the metaphysical thesis in his excellent chapter on Carnap (Chapter 3), where he argues that 'any meaningful defence of the structuralist approach to realism should at least presuppose realism about natural kinds'. (p. 68) For, if structural realists do not presuppose this, he argues, 'then the claim that theories are true, given that they are empirically adequate, becomes an *a priori* and trivial truth. If, on the other hand, they do opt for a restriction on the range of variables—so that, for instance, they range over natural classes (kinds, properties)—they have to admit that some non-structural knowledge is possible, viz. that some classes are natural, while others are not.' (p. 66) This chapter, and the two chapters preceding it, are the highlights of the book.

The semantic thesis is much less controversially an ingredient of scientific realism. Indeed, many would say that Psillos's semantic thesis just *is* scientific realism. But this thesis is really much more dubious, and Psillos's argument for it is not convincing, since it does not deal adequately with the rather obvious point that many highly successful theories are not, and are not intended to be, descriptive of the world. Carnot's theory of the heat engine, for example, does not describe the workings of any real heat engine. Nor does it purport to do so. It describes a theoretically ideal heat engine that is orders of magnitude more efficient than any ordinary one. Yet, after 175 years, Carnot's theory is still the fundamental one in the area. And it has achieved this status, even though it does not describe anything that really exists. For it still manages to tell us something very important about the world. It tells us what efficiencies are theoretically possible, given the basic processes that are essential to the working of a heat engine, and what we should have to do to make real heat engines more efficient. These theoretical predictions have stood the test of time.

Most of Psillos's book is concerned with the epistemic thesis, because Psillos thinks, wrongly, in my view, that the main difficulty for scientific realism is to justify acceptance of successful scientific theories as true, or approximately true. The main argument to this conclusion, he says, is Putnam's No Miracles Argument. This is characterised as an inference to the best explanation, in particular, to the best explanation of the empirical success of science. There is no other explanation, Psillos claims, which does not make the empirical success of science a miracle. However, this is to confuse the epistemic with the metaphysical thesis. The No Miracles Argument is an argument for a realist scientific ontology of some kind, not an argument for the truth of scientific theories. An anti-realist might say, as Popper and van Fraassen have noted, that scientific theories are bound to be more successful empirically than other kinds of theories, because they have been honed and adapted precisely in order to make them more empirically successful.

The real problem, as Psillos recognises, is not to explain why science *as an enterprise* is relatively successful empirically, but why it has, overall, been so astonishingly successful in fact. If the world were not structured in such a way as

to make such empirical success possible, he implies, then the extraordinary achievements of science would indeed be miraculous. The important question is therefore not the epistemic one of whether the well-established laws and theories of science are true, but the metaphysical one of how to explain the extraordinary predictive success of science in terms of the structure of reality. Psillos's answer to this challenging question is disappointing. Having distinguished the metaphysical and the epistemic questions, he immediately appears to confuse them. For the explanation that he offers is that the successful theories of science are as good as they are because they are *true in the relevant respects*. This answer would, perhaps, be satisfactory if one had a decent metaphysical theory of truth to fall back on, and a clear way of distinguishing the relevant respects prospectively. But the theory of truth that Psillos needs here is not developed, and is manifestly inadequate for the purpose. Moreover, as Stanford and Chang have recently argued, he makes heavy weather of giving substance to his concept of a relevant respect.

Part II of Psillos's book is mainly concerned with his attempt to refute Laudan's pessimistic meta-induction. Laudan has argued persuasively that many significant, and empirically well supported, theories in the history of science have turned out to be false. Moreover, it seems reasonable to argue, as some philosophers have, that currently well-confirmed theories are no better placed than their historical predecessors, and, consequently, are just as likely to turn out to be false. So, Psillos is forced to fall back on some form of the 'approximate truth' defence. Specifically, he has to argue that the false, but empirically well-confirmed theories of the past were approximately true, or at least were so in the relevant respects. At the same time, he has to avoid saying that the relevant respects were structural. For then his position would collapse into a form of structural realism, which is, ontologically, a much weaker form of realism than he wishes to defend.

Psillos's strategy for dealing with this historical objection is 'to divide and conquer'. His thesis is that wherever a theory with false suppositions has been empirically successful in the past, its success has been due to aspects of the theory that have effectively been retained in later theories, and so are probably true, or approximately so. If false theories yield true and verifiable predictions, he says, then these are due to the true bits of these theories. The false bits are just idle, or cancel one another out. Moreover, he argues, scientists themselves are often aware of the ways in which their theoretical presuppositions may be irrelevant to the predictions they make. So, the 'divide and conquer' strategy is not supposed to be just a case of being wise after the event. On the contrary, he says, it is possible to examine current theories carefully and reach a considered judgement about which aspects of them have been confirmed, or remain unconfirmed.

I am unconvinced that Psillos's divide and conquer strategy is successful in countering Laudan's pessimistic meta-induction. Nor am I convinced of the need for it. For the important task is to develop an ontology that will explain adequately why science has been and will remain as empirically successful as it has been. For this is the real challenge of Putnam's No Miracles Argument.

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