

## REVIEW

Stathis Psillos, *Scientific Realism: How Science Tracks Truth* (London: Routledge, 1999), 368pp., £60.00 hb, £16.99 pb.

Philosophers of science have good reason to thank Stathis Psillos for this scholarly volume, which will likely be the definitive work on scientific realism for some time to come. Plausibly, it might remain the definitive work for a very long time. For as Psillos' survey of the various forms of anti-realism and his arguments against them show, scientific anti-realism is very much on the back foot. Positivism and the semantically centred forms of anti-realism associated with it are today credited by no-one. And while widely admired, van Fraassen's constructive empiricism has attracted few believers (or even accepters). If anything, today's opponents for a full-blooded realist like Psillos are philosophers who claim to be realist but whose realism is limited or is conceived of in a weak way.

Cartwright and Hacking, for example, are happy to sign up to a realism about entities but not about theories. Psillos' treatment of this half-hearted realism is perhaps short but nonetheless effective – to believe rationally in some theoretical entity one must believe in some amount of theory, even if only a small amount. First, what discriminates a belief in, say, electrons from a belief in neutrinos, must be a difference in associated theory. Secondly, one could not have a reason to believe in electrons unless one had good reason to believe some part of a theory that tells us what electrons are and what they do. Psillos spends rather longer dealing with Worrall's structural realism. Here the problem is that the required distinction between the structure and the content of a theory cannot be made in the required way. In particular, without a theoretical interpretation, the mathematical part of a theory cannot be used to derive the experimental predictions required to confirm the theory or any part of it (including the purely mathematical part). However, even if Worrall's distinction in kind between structure and content cannot be made, Psillos accepts that a difference of degree can be appropriate. His own realism is not monolithic. Different parts of theories can be differentially confirmed by the evidence. This is important for Psillos' own defence of realism against the pessimistic induction.

Along with other forms of less than perfect realism tackled by Psillos is Fine's Natural Ontological Attitude (NOA). A widely held view is that NOA and the 'core position' that is allegedly acceptable to both realists and anti-realists collapse into one of the two rivals when put under any sort of pressure. In comparison to positivist anti-realism, Fine's acceptance of what he calls 'the usual Davidsonian-Tarskian referential semantics' seems to make NOA thoroughly realist, as Musgrave has argued. On the other hand, Fine employs an argument against what he takes to be the correspondence account of truth, an argument which he finds in Kuhn (and which is also to be found among the positivists and in Kant). The argument is that if the truth of a theory requires correspondence between the world and the theory, then ascertaining the truth of the theory would require an independent access to the world and to the theory (so as to see that they correspond). But there is no theory-less access to the world, and so ascertaining the truth of a theory is impossible. Psillos rightly dismisses this argument. But Psillos himself thinks that the realist requires a correspondence theory of truth (a truthmaker version for Psillos' money) and that a minimalist conception, such as Horwich's (and such as Fine endorses) will not do. This is a very difficult issue, but it is unclear why the realist needs all the mechanics of a full-blown correspondence theory, let alone the problems associated with it and with truthmakers. It may well be that something rather weaker is sufficient, something like the intuition that truth depends on the way the world is. This intuition appears to be violated by, for example, coherence and pragmatist theories of truth. On this view the difference between realist and anti-realist theories of truth may be characterised as a difference in the direction of fit in the disquotational schema '<math>p</math> is true iff  $p$ '. Psillos' main reason for rejecting minimalism is that it denies that substantive nature of the property of truth. He thinks that a substantive account of truth is required to answer the question 'what does each and every belief that guides particular successful actions have in common by virtue of which this systematic pattern of success is generated?' It is unclear, however, whether this 'pattern' of success is genuinely systematic, requiring one all-embracing answer. And even if we do give a general answer, that in each case the world was as the belief held it to be, it is also unclear why this answer is incompatible with minimalism and why it requires the machinery of correspondence.

It is a testament either to history or, perhaps, to the thought

that something like the natural (ontological and epistemological) attitude is realist, that most of Psillos' efforts are directed towards demolishing the various anti-realist and partially realist positions and to undermining the sceptical arguments that support them. He starts historically, dealing with positivist antirealism. Psillos gives us considerable detail on Carnap's struggles to modify anti-realism in the light of criticism, and the concessions he needed to make to realism. Although the quantity of detail is perhaps disproportionate to current interest in positivist anti-realism, we should perhaps regard Psillos' scholarly treatment as a bonus from a Carnap scholar. Of greater contemporary concern is Psillos' careful treatment of van Fraassen's constructive empiricism. There are three main prongs to Psillos' attack on constructive empiricism. First, Psillos questions how van Fraassen's epistemological anti-realism can depend upon a distinction between the observable and the unobservable, when the question 'is  $x$  observable?' is itself theoretical. Secondly, Psillos subjects the notion of acceptance as an attitude less than belief-in-truth to considerable critical scrutiny. And thirdly, Psillos deals, to my mind entirely effectively, with van Fraassen's critique of abductive reasoning.

As well as dispensing with the various forms of anti-realism, Psillos deals separately with the primary sceptical reasons for doubting realism. These he holds to be the pessimistic induction and the thesis of underdetermination of theory by evidence. Psillos deals with the former simply by denying the premises of the inductive argument, i.e. by denying claim that many past well-supported theories have turned out to be false. As mentioned, Psillos thinks, reasonably, that different parts of a theory can be differentially confirmed by the evidence. When we look at the supposed evidence for the pessimistic induction, it turns out that the parts of past theories that have been rejected by later science are parts that were never well-supported by the available evidence. At the same time, those parts well-supported by the evidence have tended to be preserved by later science. These claims he buttresses by case studies – caloric and the electromagnetic aether. In the latter case Psillos makes the contentious claim that in fact the aether is identical to the electromagnetic field, and hence that belief in the former was well-supported and has not been rejected by subsequent developments, even if particular models of the aether have been.

In criticising the thesis of the underdetermination of theory

by evidence, Psillos points out that the thesis depends upon implausible assumptions about the nature of confirmation, such as the claim that confirmation is simply a matter of the entailment of evidence by the hypothesis. Theoretical virtues are relevant to confirmation. There is no reason to suppose that every well-confirmed theory is matched by an equally well-confirmed competing theory, since 'manufactured' competitors will not share the same theoretical virtues as the preferred theory, even if they all entail the same evidence. While Psillos' criticisms are ones I happily endorse, I think he might have gone further. He seems happy to assume, along with the anti-realists, that the evidence for theories is observational. This assumption lends intuitive support to the underdetermination thesis, since the gap between observational data and highly theoretical hypotheses seems so large that van Fraassen's contention becomes plausible, that for every favoured theory there is highly likely to be another, as yet unconsidered, theory that has the same epistemic standing (indeed many such theories). But should we accept this assumption? If Timothy Williamson's argument is sound that our evidence is just what we know, then there is no reason to limit our *evidence* to the observable, unless we already accept the sceptical claim that what we *know* is limited to the observable.

Psillos' realism is the now widespread abductive sort. He argues for it using a meta-abductive argument of a kind to be found in Boyd's 'explanationist defence of realism'. The main element of this argument is that the best explanation of the predictive and experimental success of theory-laden methods is that the theories behind these methods are approximately true. Psillos regards this as an elaboration of the no-miracles argument of Putnam and others. There is a further step to the argument. Having argued that the theories in question are true, it is noted that they were arrived at by abductive reasoning. Hence it is reasonable to conclude that abductive reasoning is reliable. Psillos rightly employs externalist epistemological thinking to reject the claim that this circularity is vicious. The naturalistic nature of this move should be noted. The argument for realism is *a posteriori*; in contrast the alleged arguments for anti-realism are *a priori* (the pessimistic induction being an exception). Hence, what the meta-abductive argument may give us is a way of coming to know that our best confirmed theories do indeed give us knowledge – the meta-abductive argument cannot give us the sort of *a priori*, philosophical argument that we might hope

would convince a neutral commentator or even a fair-minded opponent.

Psillos concludes by 'refilling the realist toolbox'. One element in this is semantic – building on the causal-descriptive approach to the meaning and reference of theoretical terms. This contrasts clearly with the semantic anti-realism of the positivists, while also undermining the sort of anti-realism associated with Kuhn and Feyerabend. The other tool in Psillos' toolbox is truth-likeness. He sensibly adopts an 'intuitive' approach in contrast to various unsuccessful formal accounts, while he accepts that more formal accounts may be useful in connection with certain kinds of theory. I wonder whether verisimilitude is so important to the realist. Perhaps more useful is an epistemic cumulative view – that science gives us ever more *knowledge*. A natural (if widely dismissed) way to think of the development of science is that we first acquire knowledge of a general sort (such as knowledge of the existence of chemical atoms) and then knowledge of a more detailed sort (knowledge of the components of atoms, and then knowledge of the structural relations of those components, and so on). Since the subject matter of the successive theories may change, from atoms to their components, we need not suppose that this development consists of a series of mutually inconsistent and actually false propositions getting closer to one true proposition. Rather the set of known fully true propositions is being added to. Furthermore, one would want this progress to be characterised epistemically not simply semantically, since a succession of theories that accidentally got closer to the truth (or accidentally accumulated more full truths) would not be genuine progress at all.

Psillos' work will certainly confirm and strengthen the opinions of those of us who think that realism is the way forward. Little if anything needs to be added to his criticisms of anti-realism. And he has advanced our understanding of what a positive commitment to realism might involve. Future research in that direction will start from here.

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