The Purpose of Scientific Realism

Abstract

Against the well-known objection that in the history of science there are many theories that are successful but false, Psillos offers a three-pronged defense of scientific realism as the best explanation for the success of science. Focusing on these, I criticize Psillos' defense, arguing that each prong is weakened when we recognize that according to realist rebuttals of the underdetermination argument and versions of empiricism, realists are committed to accounting for the *explanatory success* of theories, not their mere empirical adequacy or instrumental reliability.

1. Introduction:

The most reasonable recent strategy for defending scientific realism seems to be the well-known Boyd-Putnam 'no-miracle-argument'. On this view, the evident empirical success of current physical theory in mature sciences is taken to provide good reason for believing in the truth, or approximate truth, of the theory's claims about unobservable entities and processes. Success is taken as compelling evidence for truth, because the realist hypothesis that successful theories are true provides the only, or at least the best, explanation of the fact that they are successful, and increasingly so. The great success of current scientific theories in contexts of prediction, explanation, and technical control would be a miracle without the assumption that such theories are effectively tracking the truth. So the 'no-miracle argument' goes!

In the last few decades, powerful philosophical challenges have been raised against this explanationist defense of realism. Does realism provide the best explanation of the success of science? Do we get a comparable, or better explanation, in terms of the empirical adequacy, rather than truth, of successful theories? Even if truth offers the best explanation of success, does it also confirm scientific realism? Is such 'inference-to-the-best-explanation' a reliable principle of scientific confirmation? In any case, isn't it patently question-begging in the context of justifying scientific realism? All scientific theories exhibit some mixture of empirical success and failure. What counts as the degree of success that is supposed to betoken truth? If theories can mismatch observed phenomena in certain respects and yet count as approximately true, is this notion of truth sufficiently rigorous and intelligible for a robust realism? Is approximate truth just another term for falsehood, or perhaps, a special class of falsehoods that are useful for certain scientific purposes?

In this paper, I focus on the challenge to explanationist realism based on claims concerning the history of science in the work of Kuhn, Larry Laudan, and others, and on the strategies adopted by realists to counter the historicist challenge. I will argue that these strategies raise difficulties for explanationist realists that question the way they read the history of science and how they use it to vindicate their position. In the end, my criticisms of explanationist realism motivate not anti-realism, but the exploration of a different explanationist strategy for realists.

3. Prediction Standard

Psillos' embracing of a novel-prediction standard of empirical success is vulnerable to three immediate objections, which are the subject of the rest of this section. Moreover, in the next section, we will see that these first three concerns give rise to another, more fundamental problem with explanationist realism.

First, the novel-prediction standard seems *ad hoc* in the sense that it lacks the naturalistic grounding in scientific practice that is supposed to justify the explanationist realists' use of inference-to-the-best-explanation (or IBE). Explanationists adopt a naturalistic stance in epistemology and claim that their scientific realism is a scientific hypothesis justified by the very sort of abductive inference (IBE) effectively employed by scientists in producing knowledge (Psillos 1999, 71, 78-79, 179).

The second difficulty for this standard follows on the first. If I am right, it will come as no surprise that explanationists do *not* use a novel-prediction standard in giving their own naturalistic justification of scientific realism. Psillos and other explanationists clearly assume that the ability of their theory of scientific realism, properly formulated, instantaneously to explain already well-known phenomena—the success of science—can confirm it and make it empirically successful, independently of novel prediction. What novel predictions do scientific realists make? Realists treat IBE in scientific and everyday reasoning as wholly reliable without novel prediction (Psillos 1999,70-71. 78-79). Indeed, in his critique of van Fraassen, Psillos (1999, 211-12) takes great pains to establish that such abductive inference, with or without novel prediction, fully confirms scientific hypotheses just as it does in cases

of everyday hypotheses. Psillos' adoption of a novel-prediction standard of empirical success is thus inconsistent with these other fundamental features of his and other standard realist accounts and seems to be an *ad hoc* maneuver against Laudan with little independent theoretical grounding in the former's general account of scientific inference.

Anti-realists treat all of these explanatory virtues as merely pragmatic; i.e., virtues of a theory that are irrelevant to its truth or falsity. Realists regard the presence of such explanatory virtues in a theory as confirmatory, reasons for taking the theory to be true or approximately truePsillos 1999, 171). These explanatory virtues are sometimes described as a theory's 'super-empirical' virtues. But this description is misleading for the realist if it is taken to imply that a theory can lack such explanatory virtues and still be empirically successful. For, as I read IBE realism, observational phenomena confirm a theory and count as evidence for it if and only if the theory provides the best explanation of the phenomena, *and* possesses the requisite explanatory virtues. As a result, realism is committed to the identification of empirical success with explanatory success. Furthermore, because explanatory success requires far more than empirical adequacy, instrumental reliability, or novel prediction, it is explanatory success, rather than empirical adequacy, that the hypothesis of scientific realism must explain. This result generates the third difficulty with Psillos' 'novel prediction' strategy for blunting Laudan's historicist challenge to realism.

But my claim that explanationist realism is committed to the identification of empirical with explanatory success raises a fundamental difficulty for explanationism *per se*. I now turn to this difficulty.

4. Empirical Adequacy

Faced with this difficulty, the explanationist may insist that it is enough if realism provides the best explanation of what is admittedly only one dimension, though a fundamental one, of a theory's success: the fact that it is empirically adequate, instrumentally reliable, or a good predictor of novel phenomena. If this much suffices to establish scientific realism, why worry about how to explain theories' other virtues? Yet this defense of scientific realism seems to create more miracles than it dissolves! Is it just a lucky accident that true theories turn out to be simple, consilient, unifying, and plausible, as well as empirically adequate? If these were mere pragmatic virtues, as van Fraassen holds, then the realist could relegate these aspects of theory to historical or social contingencies to be explained by social scientists or historians.

But the realist takes these explanatory virtues to be confirmatory, and thus linked to the truth of a theory. This is the key point. Shouldn't any (realist) explanation of science aiming to vindicate the truth claims of theories have the ability to explain all or most of the features of theories taken to confirm their truth or approximate truth, i.e., *all* their truth-linked properties? Doesn't realism, treated naturalistically as a scientific hypothesis, need to possess the same completeness, unifying power, consilience, and empirical adequacy that it finds in successful scientific theories, more generally? For this reason, a defense of scientific realism as the explanation of empirical adequacy *alone* weakens its explanatory and scientific credentials.

Thus the very notion of empirical adequacy required by the realist inference, from success to truth, cannot be the narrow logical notion. It must be the richer epistemic notion of explanatory adequacy or success, which the realist needs against the underdetermination argument. As a result, even if we would allow a defense of realism as the best explanation of empirical success by itself, this notion must be linked to explanatory success, so that it is consistent with realism's refusal to treat observationally equivalent theories as equally empirically successful and well-confirmed (Psillos 1999, 172-74).

My conclusion is that what the scientific realist needs to but cannot explain is the explanatory success of theories; why theories succeed in producing simple, consilient, intuitively plausible, unifying, and complete accounts of observed phenomena, or accounts with many of these virtues. Against realism, I have argued that the truth of a theory provides a very weak, implausible explanation of its explanatory virtues. I have also argued that this multi-dimensional notion of empirical success (as explanatory success) weakens Psillos' 'narrowing' strategy for blunting Laudan's challenge. The realist will have to attribute truth to many of Laudan's false-but-successful theories that Psillos hoped to exclude by his novel-prediction standard. This only strengthens the evidence for the pessimistic induction to the falsity of currently successful theories.

6. Continuity of Reference

Psillos recognizes that the realist´s first two strategies cannot succeed in overturning all of Laudan´s historical cases. In particular, he acknowledges that there remain genuinely successful theories whose success requires the postulation of entities and mechanisms that do

not exist, to the best of our knowledge. His example is the ether theory of light propagation whose empirical success, he grants, requires the posit of a luminiferous ether to explain the observable phenomena concerning the behavior of light (Psillos 1999, 114, 130-40). This theory seems to be conceptually and ontologically incommensurable with the theory of the electromagnetic field which supercedes it. That is, the successor theory does not appear to be a correction and improvement of its predecessor (Psillos 1999, 137-40, 280-81). Rather the successor seems to simply reject in toto the conceptual and ontological committments of its predecessor, replacing them with entirely different ones. From the standpoint of current knowledge, how can the realist attribute any truth or truth-likeness to the superceded theory, successful though it may have been, if it now seems to have been predicated on referential failure?

By this route, Psillos seeks to show that ether theorists´ concept of a luminiferous ether succeeded in referring to the electromagnetic field. Though they made many mistakes about the cause of light propagation, they were right in their assumption that there is a cause and in some of their assumptions concerning the causal powers that it would have to possess in order to bring about and explain these effects (Psillos 1999, 296-97). This ennables the realist to appeal to these true or truth-like components of the ether theory in order to explain its empirical success. Moreover, it allows the realist to characterize the current theory as a more successful and thus more truth-like account of the very same things that its predecessor also referred to, but with less success and approximate truth.

If ´luminiferous ether` refers to the electromagnetic field, this implies the falsity of most of those assumptions about the ether that enabled it to function as a simple, plausible, consilient, adequate explanation of light phenomena in its time and place. But then, the scientific realist cannot explain the theory´s success. In sum, the realist is hardpressed to explain the explanatory success of theories within the constraints of his or her ´whiggish` theory of reference. On the other hand, if realists preserve their explanatory resources by allowing the truth-likeness of a successful theory´s assumptions to fix reference, then they lose continuity of reference.

Thus the realist is more or less stuck having to explain the success of theories whose success depended on component claims, posits, and terms that are non-referring and false, by the lights of current theoretical knowledge. Psillos´ theory of reference does not succeed in meeting Laudan's challenges any more than his first and second ´narrowing` strategies do.

7. Alternative Realism

These difficulties with explanationist (IBE) scientific realism motivate its rivals – constructive empiricism, pragmatism, relativism, instrumentalism, etc. But the defense of explanationist realism from my arguments may well be possible if realists can establish (1) that the best explanation of the explanatory success of our best current theories includes their truth, along with other causal components of success; and also (2) that the best explanation of the explanatory success of outdated, disproven theories can proceed without need of the claim that they, any of their theoretical components, or their assertions of reference are true. I

believe that this project can be accomplished but cannot elaborate how, at the end of this paper.

REFERENCES

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