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*RELATIVISM AND REALITY: A CONTEMPORARY INTRODUCTION*. By ROBERT KIRK. London and New York: Routledge, 1999. Pp ix, 180.

*SCIENTIFIC REALISM: HOW SCIENCE TRACKS TRUTH*. By STATHIS PSILLOS. London and New York: Routledge, 1999. Pp xiii, 300.

These books make significant contributions to contemporary realism. Psillos's book presents an excellent overview of the central components of current scientific realism, the main challenges to it, and the most promising strategies for defending it. It is a work of remarkable clarity, synthesis, and argumentative rigor. Psillos's realism is committed to three claims: (1) Scientific theories make irreducible assertions about unobservable entities which are literally true or false (semantic realism); (2) In the case of mature, successful theories, their success provides good reason for taking their assertions about unobservables to be true, or approximately so (epistemic realism); and (3) What makes scientific theories true or false is the mind-independent natural-kind structure of reality (metaphysical realism).

In the first three chapters, Psillos provides a critical analysis of various instrumentalist, reductivist, and empiricist views of scientific theories in Carnap, Hempel, Craig, Ramsey, Duhem, Feigl, and others. This valuable historical background serves to establish the case for semantic realism, and motivate the shift in current debates from semantic to epistemic realism. This background also allows Psillos to highlight the novel features of van Fraassen's empiricism, which he takes to provide a unique synthesis of semantic realism with epistemic antirealism.

Most of the book builds up the explanationist argument for epistemic scientific realism. On this well-known argument, the evident empirical success of current physical theory is taken to provide good reason for believing in the truth of the theory's assertions, because the realist view that successful theories are true provides the best explanation of the fact that they are successful and increasingly so. On such inference-to-the-best-explanation (IBE), if P provides the best explanation for Q, then Q provides good reason for believing in the truth of P. Psillos's contribution is to persuasively state and honestly confront the main challenges to IBE realism. Is IBE a reliable principle of inductive reasoning well-grounded in scientific practice? Is it question-begging in the context of a defense of scientific realism? Does realism provide the best explanation of the success of science? Given that all theories fail in some respects, what counts as the sort or degree of success that betokens truth? Can't false theories succeed empirically, and true theories fail, breaking the realist connection between success and truth?

Psillos also provides robust realist responses to the following challenges: the argument from the underdetermination of theories by evidence (chapter 8), Fine's deflationary anti-epistemology of the natural ontological attitude (chap-

ter 10), Worrall's half-way house of structural realism (chapter 7), attacks on the realist notion of approximate truth (chapter 11), and arguments from the incommensurability of theories (chapter 12). But it is the above questions, most forcefully embodied in the works of van Fraassen and Laudan, that occupy most of Psillos's effort. Van Fraassen's challenge is in effect the argument that we gain a better account of the success of science as a function not of the truth of theories, but rather of their empirical adequacy; an explanation that is better because it is simpler, less risky, and more economical, while still equally adequate to the phenomenon to be explained (chapter 9).

Among many engaging points of contention, Psillos's best argument is that van Fraassen has no plausible epistemological basis for distinguishing between the inductive inferences his empiricism rejects (from success to approximate truth, from the observed to the unobservable) and the inductive inferences his empiricism requires (from success to empirical adequacy, from the observed to the unobserved but observable). On the other hand, Psillos concedes that the former cases of realist inference are cognitively riskier than the latter cases of empiricist inference—requiring the realist to embrace an epistemic "optimism" shunned by the more ascetic empiricist (221–22). This concession is perhaps all van Fraassen requires to justify his agnosticism about IBE realism.

In any case, Laudan's challenge to IBE scientific realism is the most worrisome to Psillos. For it is the only challenge that he takes to require that realism lower its sights and modify its claims (chapters 5–6, 11–12). Laudan's antirealist argument begins with the evident observation that in the history of science, many theories (for example, the ether theories of the nineteenth century) enjoyed substantial empirical success, despite the fact that to the best of our current knowledge they are false—indeed wholly false, not even approximately true, because their unobservable posits (for example, the luminiferous ether) do not exist. If false theories can be empirically successful, then the realist's truth-based explanation of success is a nonstarter. Furthermore, if past theories were successful but false, it is likely that currently successful theories are also false. Thus, Laudan's pessimistic induction from the history of science threatens to undermine IBE realism. Taking the full measure of this challenge, Psillos adopts four strategies of revising realism in order to accommodate the history of science without abandoning the realist's inference from success to truth.

First, he tightens the criterion of success by requiring that successful theories yield novel predictions in a non-ad-hoc manner, not just fit already known phenomena that they are designed to fit from the outset. This strategy is aimed at narrowing the number of past theories the realist takes to be successful and thus true, cutting against Laudan's antirealist version of the history of science. Second, Psillos rejects the inference from success to the truth of the entire theory, and yet robustly defends the inference from success to the truth of those and only those components of the theory strictly responsible for its empirical

success. This strategy is aimed at reducing the number of components of past theories the realist takes to be successful and thus true, similarly cutting against Laudan's antirealist version of the history of science. Third, Psillos develops a theory of reference that enables the realist to defend much more referential and ontological continuity between successful theories than what is implied by Laudan's antirealist argument. Such continuity of reference defeats incommensurability and vindicates the truth of parts of past theories which on the surface seem to exhibit referential failure. Fourth, Psillos adopts an intuitive notion of approximate truth or truth-likeness, which is far more consistent with well-known features of theory-construction in science than various formal accounts of approximate truth with their familiar flaws. On his notion, a theory is approximately true or truth-like if it represents and fits the observed facts—in certain respects and to a certain degree within that theory's standard of acceptable deviation from empirical exactitude. Psillos's notion of approximate truth vindicates the realist conviction that successful science arguably attains a significant measure of truth, and progress in theories' truth-likeness, even if the history of science reveals that the whole, final, complete, exact, and irrefutable truth is not to be had in science as we know it. While Psillos's four strategies of accommodation raise the level of debate over realism, each generates new problems for the realist, as follows:

(1) The "novel predictions" standard he uses to narrow Laudan's class of successful (but allegedly false) theories raises three problems. First, it seems "ad hoc" in the sense that it lacks the naturalistic grounding in scientific practice that inference-to-the-best explanation (IBE) is supposed to possess for Psillos's realist. Many scientists and philosophers of science have rejected this standard on the reasonable grounds that how well a theory explains, or is confirmed by, a body of evidence should not depend on the contingent matter of when the evidence is discovered or when and how the theory is constructed or modified to account for the evidence. Second, in his debate with van Fraassen over IBE (the mouse explanation example, on 221) and in his own use of IBE to justify scientific realism (70–99). Psillos clearly assumes that the ability of a theory (for example, realism) to "all-at-once" explain well-known phenomena (for example, the success of science) can confirm it and make it successful, independently of novel predictions. Third, and most important, Psillos takes realism to imply that there are multiple standards and dimensions of a theory's explanatory virtue and empirical success: its simplicity, empirical adequacy, consilience—the breadth and scope of its explanatory power, completeness, indirect theoretical support, and intuitive plausibility based on background knowledge (171–76). As a result, the allegedly successful-but-false theories Laudan cites and Psillos rejects (for example, Le Sage and Hartley's contact-action gravitational ether theory (105)) may have satisfied most of the realist's standards of IBE success, even if Psillos is right that they failed to satisfy the "novel predictions" standard. Empirical success in science always involves some

such trade-offs in the matter of which standards a theory fulfills at the expense of which others. Once Laudan's set of allegedly successful theories are evaluated by the realist's full set of standards for success, Psillos's narrowing strategy seems weak and unconvincing. It depends on ignoring all but one—and a dubious one at best—criterion of success ("novel predictions").

(2) These same considerations create problems for Psillos's second strategy of restricting the realist commitment of truth to only those components of a theory genuinely responsible for its empirical success. Focusing on but one standard and dimension of success ("novel predictions"), Psillos can plausibly argue that a successful theory (for example, the caloric theory of heat) had components (for example, the existence and causal role of the caloric) that did not play any essential role in producing its success (the novel prediction of calorimetric laws such as the conservation of heat (115–19)). But the strategy weakens considerably, as soon as we recognize that such components (for example, the caloric) may have played an essential role in enabling the theory to satisfy the realist's other standards and dimensions of success (for example, the role of the caloric in providing a simple, consilient, intuitively plausible, causal explanation for a wide variety of heat phenomena). Given Psillos's multiple criteria of success and truth, a certain skepticism arises concerning his strategy of neatly distinguishing between the parts of a theory that do and those that do not really contribute to its success, and thus count as true.

(3) Psillos's third strategy is to develop a novel theory of reference for theoretical terms that can circumvent incommensurability and preserve the truth-likeness of successful theories (for example, the ether theory of light propagation) that seem to posit non-existent entities (for example, the luminiferous ether). His theory seeks to overcome flaws in current causal and descriptive accounts, while taking elements of both (281–300). To simplify his theory a bit, two theoretical terms 'L' (the luminiferous ether) and 'E' (the electromagnetic field) refer to the same entity if and only if there is some overlap in the kind-constitutive properties attributed to L and E by their respective theories in virtue of which each is taken to play a causal role in bringing about the effects both theories seek to explain. We use our current most successful theory to determine the referent and its properties (for example, the electromagnetic field) and to both secure the reference and give a realist explanation of the success of its predecessor (the ether theory). The difficulty with Psillos's account is that the realist may be unable to explain the explanatory success of a past theory if its reference is fixed not by its own structure of explanatory hypotheses, but rather by those of current theory. The IBE realist needs to explain how the ether theory succeeded in providing a simple, consilient, intuitively plausible, accurate, and complete account of heat propagation. Such success was surely driven by its advocates' assumptions concerning the properties of the luminiferous ether, though many of them are false and imply a total failure of reference, by the standards of electromagnetic theory. On the other hand, if we

allow continuity of reference through Psillos's whiggish theory of reference (allowing that 'the luminiferous ether' refers to the electromagnetic field), then the realist will lose the ability to explain the success of the past theory. But this was the whole point of the realist's theory of reference in the first place.

(4) Psillos's fourth strategy of embracing an intuitive notion of truth-likeness threatens his realism with relativist implications. If all my previous three criticisms are plausible, what may follow is that most if not all theories from Aristotle to current science were successful to some extent in meeting realist standards and thus were truth-like, in Psillos's intuitive sense. Unsettling as this picture is for Psillos, it may nonetheless be compatible with the realist view that current theories are more truth-like than their manifestly less successful predecessors. But on Psillos's intuitive notion, whether a theory is truth-like is a matter not just of its degree of fit with facts, but also of its fitting facts in some respects, and not others. This notion is compatible with the Kuhnian view that in the history of science, there are qualitative changes in which aspects or dimensions of nature theories represent, as when chemists after Lavoisier and especially Dalton, give up the alchemists' focus on the sensible qualities of substances like the ores and metals. Psillos's notion of approximate truth allows a relativity in the respects in which rival or successive theories are truth-like, even when they purport to be about the same things. This raises the decidedly anti-realist possibility that a current theory may be more empirically successful but not more truth-like than some predecessor, because the respects or ways in which each is, with some degree of accuracy, truth-like are irreducibly different.

Robert Kirk's short, readable, and engaging book provides an excellent introduction to the considerations that motivate relativism and the reasons they are not convincing. Our access to reality is largely shaped by human thought, which in turn varies in accordance with contingencies of temperament, time, language, place, and culture. Do these features of the human condition provide good reasons for holding that reality and truth are themselves relative to these contingencies, changing in accordance with the beliefs or needs of the judge? Kirk's first three chapters set the stage and draw the beginner into these issues. They explain how science with its claim to truth emerges out of myth, how philosophers have conceived of truth, and why the first versions of relativism and social constructivism that occur to us are self-refuting or manifestly implausible. The heart of the book explores the far more sophisticated arguments for relativism based on the ideas of our most influential philosophers: Wittgenstein (language-game, private language, rule-following), Quine (naturalism, holism, the indeterminacy of translation), Neurath (anti-fundamentalism), Dunnett (verificationism, antirealism), and Rorty (postmodernism, pragmatism).

In each case, Kirk provides a highly clear, succinct overview of the thinker's key ideas, highlighting the ways they have been used, often by oth-

ers, to defend the relativity of the true and the real to human practices. His strategy is to grant the epistemological insights of these thinkers: (1) that our beliefs and knowledge about reality are always mediated by the rules of a language-game, the theory to which we are committed, our cognitive decisions, or the concepts most useful to our practices; and (2) that reality by itself does not uniquely dictate which language-game, theory, concepts, or cognitive choices we employ and which are, in this sense, "up to us." Nonetheless, Kirk argues, neither of these insights implies that what is true and real is "up to us." Nor do they require that we deny the externality and independence of reality from our language-game, theory, concepts, or goals. Beyond that, Kirk draws on commonsense realism to underscore all the ways in which our attitudes towards our theories, concepts, and language-games (for example, they can disagree, exhibit inconsistency, be wrong, get corrected, etc.) imply the externality and independence of reality.

In the last two chapters, Kirk takes up a wider set of concerns about the implications of scientific realism. He argues that this realism does not imply the devaluation, elimination, or reduction of moral values, everyday ways of understanding others or nature, or the distinct discourses of common sense and psychology.

Kirk's useful book will serve well to draw beginning students into classic philosophical issues and to throw a cold wet blanket of self-doubt over the relativism many thoughtlessly embrace; all to the good. Nonetheless, the critical reader may find reason to pause in the midst of some of Kirk's enthusiasms. For one thing, Kirk tends to put truth and reality in the same boat. As a property of assertions or propositions, truth exhibits a closer dependence on human language and cognition than does reality. While Kirk doesn't deny this point, he fails to explore its implications, for fear that he will fall into relativism (169–70). For another thing, Kirk tends to run together relativity and relativism. Even if truth and reality do not vary, relativistically, with changes of theory, language-game, practice, etc., truth and reality may depend on (or be relative to) universal structures of human language, experience, or cognition. Relativity to universal human powers does not imply relativism, and is the more plausible position—from Kant to contemporary cognitive science. While he briefly flags the Kantian position (as "unsettling" (77–78)), Kirk never critically engages it. Similarly, he runs together (1) the plausible realist claim that what is true and real is *not entirely* up to us with (2) the less plausible realist claim that what is true and real is *in no way or degree* dependent on us—our general human powers, interests, or categories.

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