Book Review

Alan Musgrave, *Essays on Realism and Rationalism*. Rodopi, Amsterdam-Atlanta, 1999.

Alan Musgrave has been one of the most important philosophers of science in the last quarter of the 20th century. He has exemplified an exceptional combination of clearheaded and profound philosophical thinking. Two seem to be the pillars of his thought: an uncompromising commitment to scientific realism and an equally uncompromising commitment to deductivism. The essays reprinted in this volume (which span a period of 25 years, from 1974 to 1999) testify to these two commitments. (There are two omissions from this collection: "Realism, Truth and Objectivity" in *Realism and Anti-realism in the Philosophy of Science* (1996, Kluwer) and "How to Do without Inductive Logic" (*Science & Education* vol. 8, 1999). (I will make some references to these papers in what follows.) In the present review, instead of giving an orderly summary of the 16 papers of *Essays*, I discuss Musgrave's two major commitments and raise some worries about their combination.

Musgrave (1996, 19) takes realism to be, "first and foremost a thesis about the aim of science. It says that the aim of a scientific inquiry is to discover the truth about the matter inquired into." So he takes realism to be an "axiological thesis": "science aims for true theories." This view already appears in the first chapter of *Essays* (which was published in 1977) and has remained central to Musgrave's realism. There is clear motivation for this axiological approach: even if *all* theories scientists ever came up with were false, realism wouldn't be threatened. Musgrave does not think that all our theories have been, or will be, outright false. But he does take this issue (whatever its outcome be) to have no bearing on whether realism is a correct attitude to science. There are, however, inevitable philosophical worries about the axiological characterization of realism. First, it seems rather vacuous. Realism is rendered immune of any serious criticism that stems from the empirical claim that science has a poor record in truth tracking. Second, aiming at a goal (truth) whose achievability by the scientific method is left unspecified makes its supposed regulative role totally mysterious. Finally, all the excitement of the realist claim that science engages in a cognitive activity that pushes back the frontiers of ignorance and error is lost.

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Essays does address these issues in several places. What emerges is that Musgrave takes realism to be a modest philosophical thesis (what he calls "critical realism" or "undogmatic realism") whose basic commitments are that (1) scientific theories can be true or false, (2) their truth can never be fully established but it always remains conjectural, and (3) their truth is never ultimate in that theories do not offer ultimate explanations of the phenomena (see pp. 15, 18, 50, 53, 121, 125). This "modest" view is enough to distinguish scientific realism from instrumentalism and perhaps from constructive empiricism. But one may wonder: couldn't a more presumptuous realist thesis be defended? Couldn't one claim that there are reasons to believe that at least *some* scientific theories are true or approximately true of the world? Indeed, some realists think there is reason to subscribe to the following *Epistemic Thesis*: Mature and predictively successful scientific theories are well confirmed and approximately true.

The standard way to defend the *Epistemic Thesis* has been via the "no-miracles argument" (henceforth, NMA). Crudely put, the argument is that the best explanation of the empirical success of scientific theories is that these theories are approximately true (this is a crude formulation, I repeat). Now, Musgrave has been one of the first to stress that in the foregoing argument, the emphasis should be on *novel* predictions (pp. 55, 119): what needs to be explained is *novel* success. Indeed, *Essays* contains his classic 1974 paper "Logical versus Historical Theories of Confirmation," which offers an emendation and elaboration of the Worrall-Zahar use-novelty account of novel predictions. Besides, Musgrave does try to defend NMA. He (p. 60) takes NMA to be an inference to the best explanation and concludes (p. 69) that the realist explanation of the novel success of science is the *best*. Actually, Musgrave has produced some powerful arguments to the effect that nonrealist explanations of the success of science are less satisfactory than the realist one (see chap. 3). Does then Musgrave endorse NMA? The answer is not straightforward.

Precisely because Musgrave takes NMA to be an inference to the best explanation, he takes it to be deductively invalid and hence fallacious. Here is where his second major commitment looms large. Being a deductivist, he takes it that the only arguments worth their salt are deductive. So he cannot endorse the NMA, at least as it stands. As he puts it, deductivism is the view that "the only valid arguments are deductively valid arguments, and that deductive logic is the only logic that we have or need" (1999, 395). Musgrave takes all prima facie nondeductive arguments to be *enthymemes*: arguments with a missing or suppressed premise. After the premise is supplied (or made explicit), the argument becomes deductively valid. But it may or may not be sound (see pp. 87, 281ff.). According to Musgrave, nondeductive arguments are really deductive enthymemes, with "inductive principles" as their missing premises.

As is typically presented, Inference to the Best Explanation (IBE) has the following form (see pp. 284-85):

(*IBE*)
(i) *F* is the fact to be explained.
(ii) Hypothesis *H* explains *F*.
(iii)Hypothesis *H* satisfactorily explains *F*.
(iv)No available competing hypothesis explains *F* as well as *H* does.
(v) Therefore, it is reasonable to accept *H* as true.

Given that this argument pattern is invalid, Musgrave proposes that it should be taken to be enthymematic. The missing premise is the following epistemic principle (cf. pp. 284-85): "It is reasonable to accept a satisfactory explanation of any fact, which is also the best explanation of that fact, as true."

Add to (*IBE*) the missing premise, and you get a valid argument. The deductive version of IBE is this:

(*D-IBE*)
If hypothesis *H* is the best explanation of the fact to be explained, then it is reasonable to accept *H* as true.
H is the best explanation of the evidence.
Therefore, it is reasonable to accept *H* as true.

This is a valid argument. Besides, Musgrave (p. 285) thinks that "instances of the scheme might be sound as well." In any case, he notes that the missing premise "is an epistemic principle which is not obviously absurd" (p. 285). In light of this, it's no surprise that Musgrave reconstructs NMA as an enthymeme. What is worth stressing is that Musgrave takes NMA to aim to tell in favor of the realist *Epistemic Thesis*. Though he formulates realism in terms of his own axiological thesis, he takes it that, if successful, NMA makes it reasonable to accept that truth has been achieved.

Musgrave thinks that the only kind of validity is deductive validity. He denies that there are nondeductive cogent arguments. He takes it that rule-circular arguments in favor of inferential rules may have only some psychological force (see pp. 289-90). Yet he (p. 295) is aware of the point that the proof of the soundness of *modus ponens* requires the use of *modus ponens*. How does he react to this? It seems he has wavered between two thoughts. The first is that "there is little future in the project of 'justifying deduction'" (p. 296). As he acknowledges, "Any 'justification' which is non-psychologistic will itself be a deductive argument of some kind, whose premises will be more problematic than the conclusion they are meant to justify" (p. 296). To be sure, he immediately adds that there is a difference between deductive rules and nondeductive ones in that, even if neither of them can be "justified," nondeductive rules can be *criticized*. But how much pause should this give us? Let us grant, as we should, that none of our basic inferential rules (both deductive and nondeductive) can be "justified" without rule-circular arguments. The fact that the nondeductive rules can be criticized more severely than the deductive ones should make us be more cautious when we employ the former. That's all there is to it. The second thought that Musgrave has (see

pp. 96-97) is that there is a sense in which deduction *can* be "justified," but this requires an appeal to "deductive intuitions." As he (p. 95) graphically puts it, "In learning logic we pull ourselves up by our bootstraps, exploit the intuitive logical knowledge we already possess. Somebody who lacks bootstraps ('deductive intuition') cannot get off the ground." This is, I think, exactly right. But exactly the same response can be given to calls for "justifying" nondeductive rules. When it comes to issues concerning the vindication of inference to the best explanation, if one lacks "abductive" intuitions, one lacks the necessary bootstraps to pull oneself up.

In any case, is deductivism correct? There are two aspects in this question: a descriptive and a normative. As a descriptive thesis, deductivism seems wrong. Though deductive reasoning is indispensable, it hardly exhausts the content and scope of human (and scientific) reasoning. Is then deductivism to be construed as a *normative* thesis? I am aware of no argument to the effect that deductivism is normatively correct. (Note that a cogent argument for deductivism would have to be deductively valid. Note also that the deductivist claim should not be confused with the claim that deductive logic is normatively correct. Nor can deductivism gain any normative strength from the validity of deductive logic.) Musgrave suggests that reconstructing supposed nondeductive arguments as deductive enthymemes "conduces to clarity" (pp. 284-85). I think this point is problematic. Nondeductive arguments (e.g., simple enumerative induction, or inference to the best explanation) are *not* unclear. If anything, the problem with them is how to justify them. But, as we have seen, a similar problem occurs with deduction. Suppose, however, that we leave this problem to one side. Suppose that we grant that turning a nondeductive argument into a deductively valid one conduces to clarity since it makes its premises explicit. Deductivists still face a problem: what, if anything, justifies the missing premise? To fix our ideas, consider the major premise of (*D-IBE*) above. What justifies the principle "If hypothesis *H* is the best explanation of the fact to be explained, then it is reasonable to accept *H* as true"? The skeptic can always object to this principle that it is question begging. How can a deductivist reply to this charge?

Musgrave (chap. 16) does consider this problem. He takes the skeptic to rely on the following idea, which Musgrave calls "justificationism": "a reason for believing P must justify P, show that P is true or at least probably true" (1999, 408; see also p. 319). Not surprisingly, he rejects justificationism. In fact, he also attributes this view to Popper and claims that Popper's solution to the problem of induction (the problem of whether Hume's irrationalist conclusion can be avoided) consists in his denial of justificationism. So, Musgrave claims, if justificationism is abandoned, the fact that the reasons that support the major premise of (*D-IBE*) are not conclusive is *not* a reason not to believe in the major premise. I think this is exactly right. But it has a repercussion that Musgrave does not seem to appreciate. Justificationism also lingers behind the skeptic's own critique of induction. If justificationism is to be abandoned, as it should be, it should be abandoned in *all* contexts: for deductivism as well

as inductivism. It seems, then, that Musgrave himself offers us a strong reason to hold onto inductivism. Rationalism simply cannot be equated with deductivism.

Indeed, the last chapter of *Essays*, which is the correct statement of Critical Rationalism (and the most interesting and plausible one I have ever read), seems to make a rather surprising (but exciting) claim that Critical Rationalism should be accompanied with a sort of *voluntarism* (that is not Musgrave's term). The idea is that one can be reasonable in believing some proposition P (e.g., that a theory T is true) even if the evidence that there is for it does not raise its probability of being true. So Musgrave takes it that it is rational to have evidence-transcendent beliefs. In fact, he takes Critical Rationalism to be the view that "if a hypothesis has withstood our best efforts to show that it is false, then this is a good reason to believe it *but not a good reason for the hypothesis itself*" (p. 322). As a result, he allows belief in the truth of theories, though he also takes it that the evidence will never make them probable. Though this issue requires further reflection, it seems to me that the idea boils down to this: there can be *pragmatic reasons* for believing in the truth of theories. Whether this is enough for this belief being rational is still, I think, an open issue. For, I would say, rationality is tied to *epistemic* reasons for belief, and these reasons are such that they should at least make the belief more likely to be true than false.

Essays on Realism and Rationalism contains a lot more than I have hitherto described. Among other things, Musgrave offers a sustained critique of epistemic conceptions of truth (chaps. 9 and 10), a thorough defense of the view that laws of physics do not lie (chap. 6), a rebuttal of the myth that ancient astronomy was instrumentalist, a marvelous demolition of the view (what he calls "Wittgensteinian Instrumentalism") that lawlike statements are not truth valuable but that they are domain-specific rules of inference (chap. 4), and the best case that has been made so far for the claim that deductive arguments can be heuristically useful in the context of discovery (chap. 15).

I am certain that most professional philosophers of science and many graduate students will have already read at least some of the papers published in *Essays*. If they haven't, they must. *Essays in Realism and Rationalism* offers an overview of Musgrave's developing thought. It is packed with good argument, sound judgment, and philosophical insight.

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