Review of ‘Theoretical virtues’ by S. Schindler

Should we believe our best scientific theories? The common sense answer of ‘yes’ faces two main challenges. First, for every theory that explains our evidence, there are countless incompatible theories which also explain our evidence. This is a version of the *Underdetermination Argument* and is analogous to sceptical evil-demon type challenges. Suppose we have dealt with such sceptical worries. We still face the second challenge that many past scientific theories have turned out to be false. Induction suggests that current scientific theories will also turn out to be false. So runs the Pessimistic Metainduction Argument.

 Samuel Schindler offers a sustained argument – in fact four well sign-posted arguments – that we should believe our best scientific theories i.e. realism. Chapter 1 explains that if we are going to believe scientific theories even in the face of incompatible theories that fit our evidence, our scientific theories must have virtues that go beyond the evidence. He summarizes the main purported virtues – non-ad hocness, consistency, unification, simplicity and fertility – and argues (*first* argument) that simpler theories are more likely to be true.

 Chapter 2 discusses the *Pessimistic Metainduction Argument*. Schindler argues that although we have reason for caution, in cases where a theory has *all* of the theoretical virtues, we have good reason to believe it is true. This is his *second* argument for realism.

 Chapter 3 discusses novel predictions. Using detailed historical case studies, he argues that whether a theory predicts a novel piece of evidence or merely accommodates the evidence has little effect on whether scientists accept the theory. Thus making novel predictions is not a virtue.

 Chapter 4 discusses fertility, specifically the version defended by McMullin, according to which a theory is fertile when it is successfully de-idealized over time e.g. Newton originally made the idealizing assumption that the sun had infinite mass in his calculations, and later dropped this assumption. Schindler argues that the very example McMullin used to demonstrate this – the Bohr-Sommerfeld model of the atom – is not a case of de-idealization. Thus fertility is not a virtue.

 Chapter 5 discusses ad hocness. He argues that ad hocness is bad to the extent that the modification does not *cohere* with the original theory. Thus, his *third* argument for realism is that coherence is a virtue (Bonjour 1985) – coherent theories are more likely to be true than incoherent theories and realism is more coherent than anti-realism.

 Chapter 6 offers his fourth argument, which is roughly that scientists *do* believe the theories that have theoretical virtues, and this is rational only if having theoretical virtues gives us reasons to believe theories. This raises the question of whether we can make an inference from what scientists *do* to what they *ought* to do. This is the topic of chapter 7, in which Schindler argues that a study of the history of science can help us discover norms, but cannot help motivate them.

 Finally, there is an epilogue on the Demarcation Problem, in which Schindler gives a sympathetic hearing to the Paradigm/Basic predicate solution, according to which paradigm science has various features, and anything sharing enough of these features is science.

 The book is clearly written, well-informed about both philosophy and history of science, and makes numerous incisive points. I would recommend this an excellent guide to the literature, due to its clear overarching narrative thread, and the fact that Schindler is not afraid to point out various oddities and sources of confusion in the literature. Among my favourite claims are: that explaining why false theories can be successful counts against realism, as opposed to supporting realism as Saatsi and Vickers (2010) suggest (p.46-47); that John Worrall (1985, 2014) gives two non-equivalent formulations of ad hocness (p.73); that Hitchcock and Sober (2004) presuppose that novel success is a goal, as opposed to arguing that it is a goal (p.77); that Nolan’s (1999) criticism of McMullin’s (1976) theory ignores the reasons McMullin gives (p.99-100).

 However, when it came to the positive arguments for realism I was a little disappointed. Schindler’s first argument – that simpler theories are more likely to be true – is based on Barnes’s (2000) superfluousness argument.[[1]](#footnote-1) Schindler writes that ‘[e]ntities postulated by our theories gain support only by virtue of helping us explain the phenomena. If an entity is explanatorily superfluous in the sense that a theory can explain the phenomena just as well without that entity, then the entity should not receive any support from the phenomena that the theory explains.’ p. 17-18. The idea is that this justifies our preference for simpler theories, which leads to realism.

 I see two problems. The first problem is the narrow range of cases to which this argument applies. The argument finds no fault with complex theories which have no superfluous entities. But the realist must find more fault than that. The evil demon hypothesis has no superfluous entities. Nor does a Rube-Goldberg machine – take out one item and the machine stops working.

 The second problem is that the superfluousness argument seems to presuppose that we should prefer simpler theories – which is what it’s supposed to show. Suppose we are neutral about simplicity. So we have no aversion to postulating extra entities, even if they increase complexity. Grant that the extra entities we posit are not supported by our theory. Why shouldn’t we postulate them? Without some initial preference for simpler theories, there is no problem with postulating extra entities, whether supported or not. The assumption that we should not posit entities without the support of a theory is a version of Ockham’s razor – which is what’s at issue.

 Schindler’s second argument for realism is based on the claim that in cases where a theory has *all* of the theoretical virtues, we have good reason to believe it is true. But this won’t be effective against the anti-realist who holds that *none* of the theoretical virtues give us reason to believe in theories that have them.

 The third argument is that coherent theories are more likely to be true. The appearance of Bojour’s coherentism here is surprising. Various writers have objected that Bonjour never made the concept of coherence sufficiently clear, and, worse, relies on the implausible assumption that the world is more likely to be coherent than incoherent.[[2]](#footnote-2) Schindler doesn’t engage with these objections.

 The fourth argument is that scientists *do* believe the theories that have theoretical virtues, and therefore that they *should*. But in the following chapter (7) Schindler is explicit that ‘norms about science are discovered through historical analysis, but not justified by historical facts’ (p.199). So the fact that scientists do believe theories does not tell us that they are justified in doing so. And even if it did, this type of argument could not tell us *why* they are justified in doing so. Compare: The fact that rational people believe they have hands might tell us that it is rational to believe you have hands, but does not tell us *why* it is rational to believe this.

 So although I’m not convinced by the positive defences given for realism the book performs a valuable service in laying out the central debates about realism in a clear and engaging way, and for clearing up various confusions in the literature. It is accessible enough to be used for an advanced undergraduate course and will also be of value to researchers in the field.

**References**

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1. Schindler suggests that it can be traced back to Mill (1867, p. 526) [↑](#footnote-ref-1)
2. Kornblith 2000; Brueckner 2001; Beebe 2009, Biggs and Wilson 2016 [↑](#footnote-ref-2)