more self-conscious about our own metaphorical strategies. On the general question of metaphorical strategies, a more comprehensive introductory chapter exploring in greater detail the nature of metaphor and its fundamental cognitive function would have been helpful and might have advanced a clearer understanding of strengths and weaknesses of the metaphorical usages deployed by López's chosen theorists. On the substantive chapters, some work better than others. The chapter on Marx is particularly strong; the chapters on Weber and Althusser seem to me to be the weakest, for reasons which have been indicated. Yet all of the chapters contain thought-provoking analyses which stimulate the reader to return to the old texts with a fresh eye. This is an achievement on which the author is to be congratulated.

Stathis Psillos. *Philosophy of Language and the Challenge to Scientific Realism*. By Christopher Norris. London: Routledge, 2004. 272 pp. 0-415-32786-5, paperback £18.99.

During the first half of the twentieth century, the philosophical thinking about science was dominated by the logical empiricists. They were empiricists in that they rejected the possibility of synthetic a priori knowledge and held the view that all scientific knowledge stems from experience. But they also thought that the new empiricist image of science had to adhere to the formal logico-mathematical framework made available by Hilbert, Frege and Russell in order to erect a *logic of science*, that is, a formal theory in which the language of science, as well as the very relationship between theory and experience, are analysed and explicated. The logical empiricists treated scientific realism with suspicion. They recognised the indispensable role of theories in providing a framework in which (descriptions of) observable phenomena are embedded. Yet, they also thought that theories could not have excess semantic and empirical content over their observational consequences. They embarked on the project of trying to define (by means of explicit or implicit definitions) theoretical terms in virtue of observational ones. Theories could then turn out to be true-valuable and true, but their truth was not ontologically inflationary: it did not imply the existence of unobservable entities. As, however, this reductive project started to crumble, the logical empiricists became more liberal. They recognised the 'excess content' of scientific theories over their observational consequences, but they thought they could still avoid commitment to unobservable enti-

ties, based on the view that a theory need not be true (nor ontologically committed to unobservables) to be good and useful. If, as they thought, prediction and control was all that mattered, an instrumentalist construal of scientific theories was the option that empiricists should follow.

By the 1960s, the tide had started to move the scientific realists' way. Help came from an unexpected quarter. Quine's pragmatism[1] blurred the alleged distinction between positing observable entities and positing unobservable ones. Both cases are on a par: entities are posited to help us formulate laws and to order sensory experience. But it was Sellars'[2] and Smart's[3] arguments that swayed the balance in favour of realism. Sellars attacked the *myth of the levels* and argued for the explanatory indispensability of unobservable entities: unobservables posited by a theory explain *directly* why (the individual) observable entities behave the way they do and obey the empirical laws they do (to the extent that they do obey such laws). Smart, on the other hand, argued that scientific realism leaves no space for a cosmic-scale coincidence: it is *because* theories are true and *because* the unobservable entities they posit exist that the phenomena are, and are related to one another, the way they are. Smart's key point was that scientific realism should be accepted on the basis of an abductive argument: it offers the best explanation of the way the world appears to be.

The realist turn of the 1960s consolidated semantic realism. This treats theoretical statements as having irreducible truth-conditions, where the irreducibility is two-fold: a) the referred to entities are irreducible, and b) the truth-conditions of an assertion as a whole are not reducible to evidence- or verification-conditions. If semantic realism is adopted, we have a straightforward answer to the following question: what is the world like, according to a given scientific theory? The answer is none other than that the world is the way the scientific theory—literally understood—describes it to be.

It then seems that the only way one could *fail* to be a scientific realist is by going for scepticism. One could take theories at face value and yet refrain from asserting that they *are* true (in particular, in what they claim about the unobservable world). The basis for this kind of scepticism was a commitment to a strict understanding of empiricism. If experience is circumscribed in such a way that it includes only what is observable, and if

[1] W. v. O. Quine, *Word and Object*, (Cambridge MA: MIT Press, 1960).
[2] W. Sellars, *Science, Perception and Reality*, (Atascadero CA: Ridgeview P.C., 1963).
[3] J.J.C. Smart, *Philosophy and Scientific Realism*, (London: RKP, 1963).

an epistemic policy is accepted to the effect that experience *cannot* warrant any kind of belief in unobservable entities, then empiricism cannot be the route to scientific realism. This kind of claim had been resisted by *some* empiricists, most notably Reichenbach.[4] He argued that even if we grant, as we should, that all knowledge starts with experience, its boundaries depend on the legitimacy of the methods employed. It is perfectly compatible with empiricism to accept ampliative (inductive-abductive) methods and to accept the existence of unobservable entities on their basis. So, strictly speaking, there is no incompatibility between being an empiricist (which, after all, is an epistemological stance) and being a scientific realist (which, after all, is a metaphysical stance). But the dominant empiricist view resisted this move from empiricism to scientific realism, ultimately, by resisting the legitimacy of ampliative methods.

Philosophy of Language and the Challenge to Scientific Realism fills an important gap in the debate on scientific realism by looking into Norwood Russell Hanson's philosophy of science. Though Norris does not quite put it this way, I think Hanson's key (though neglected before Norris's book) contribution to the debate was that he made possible a non-sceptical version of scientific anti-realism. Put in a nutshell, Hanson's idea is that one can believe in whatever is posited by modern science and accept that theories are, by and large, true, while avoiding metaphysical commitments to a mind-independent world and robust realist accounts of truth. The details of Hanson's position are intriguing and subtle and Norris does an excellent job in describing (and criticising) them. But it is useful to keep the big picture in mind, if we are to assess Hanson's contribution. Hanson died prematurely and we can only speculate as to how his views would have developed. But, as Norris amply illustrates, he felt the tensions and problems of the position he was trying to develop.

Hanson was deeply influenced by the later Wittgenstein, and in turn deeply influenced Kuhn and Feyerabend. He employed centrally the Wittgensteinian idea that there is not a ready made world. Rather, what there is and what one is committed to depends on the 'logical grammar' of the language one uses to speak of the world. Wittgenstein's 'logical grammar' has nothing to do with the formal logic on which the logical

[4] Hans Reichenbach, *Experience and Prediction: An Analysis of the Foundations and the Structure of Knowledge*, Chicago, IL: The University of Chicago Press, 1938.

empiricists tried to build their own logic of science. Rather, it is meant to capture the interconnections of the uses of key concepts that structure a certain language-game. Science is no less a 'language-game' than others. This game is characterised by its norms, rules, practices and concepts, but all these are *internal* to the game: they do not give the language-users purchase on an independent world. One can then play the science language-game and adhere to its norms and practices. One can follow the scientific method (whatever that is) and come to accept theories as true as well as believe in the existence of unobservable entities. One can, that is, behave as a scientific realist: one need not be a sceptic. But, on Hanson's view, one need not (perhaps, should not) add to this behaviour any robust realist metaphysics. Nor should one build into the language-game a concept of truth that is evidence-transcendent.

As Norris explains, Hanson's philosophy of science has three important entry points. The *first* comes from rejection of the empiricist view that there can be a theory-free observational language. In fact, Hanson went much beyond this negative thesis. Based on Wittgenstein's claim that all seeing is 'seeing as', he argued that all perception is aspect-relative: there is no way in which Tycho Brahe and Kepler saw the 'same thing' when they turned their eyes to the heavens, since eyes are *blind* and what they see depends on what conceptual input shapes their seeing. This positive thesis leads quickly to claims of incommensurability. In fact, as Norris argues (Chapter Two), it leads quickly to perceptual relativism, which renders impossible any attempt to make sense of the empirical basis of science in a way independent of the language-game we adhere to. This first entry point loses the world as a mind-independent structured whole, but reinstates a paradigm-relative world, viz., a world of phenomena as they are shaped by a certain language-game.

Hanson's *second* entry point comes from quantum mechanics. He bought into the orthodox (Copenhagen) interpretation of it and thought that this leads to inevitable changes in the way we see the world and the way we raise epistemological questions. Presumably, quantum mechanics reveals the inherent limitations of the claim that the world is objective and mind-independent. It also sets limits to what can be known of it and to what kind of theories can be true of it. Norris (Chapters Two and Three) discusses in some detail Hanson's disapproval of any Bohm-like theory of quantum phenomena and his commitment to a radical discontinuity between the quantum world and the classical one. Here again, Hanson drew the con-

clusion that accepting quantum mechanics (in its orthodox interpretation) amounts to adhering to a new language-game in light of which the old (classical) language-game makes no sense.

Finally, Hanson's *third* entry point comes from his work on the 'logic of discovery'. In his *Patterns of Discovery*, he did perhaps more than anyone else to legitimise abduction, viz., the mode of reasoning according to which a hypothesis is accepted on the basis that it offers the best explanation of the evidence. As Norris details (Chapter Four), Hanson was no friend of instrumentalism. He had no problem in taking scientific theories at face value. He had no qualms about scientists' going beyond the observable evidence and accepting the existence of unobservable entities on an abductive basis. These unobservable entities are neither logical fictions nor conceptual constructions. They are part of the furniture of the world. But which world? Hanson's answer is again tied to the idea of language-games: the world as specified by the language-game of science. This world is infested with causal-explanatory connections that underlie the legitimate uses of abductive reasoning, but these connections are, again, the product of several linguistic rules and practices.

It is not hard to see how these three entry points make possible a non-sceptical version of scientific anti-realism: science is not in the business of discovering the structure of a mind-independent world; rather, it is the language-game which imposes structure onto the world and which specifies what facts there are. Accordingly, science can deliver truth, but the truth it delivers is determined by the epistemic resources and practices of the language-game that constitutes science. This is more evident, as Norris notes (Chapter Five), in Hanson's notion of a *pattern*. Patterns (the ways objects are conceived) have empirical implications, but they are *not* themselves empirical: they are imposed by the conceptual scheme and to deny them is to attack the conceptual scheme itself. (See Norris, pp. 113, 115.) There is a Kantian ring to this view. But in Hanson's case, the result is relativised Kantianism. For, in light of perceptual relativism and incommensurability, there is a plurality of language-games each of which constitutes its own phenomenal world. The 'objective' world is either lost or reduced to a *noumenal* blob.

This last point brings to the fore a central problem that Hanson's anti-realism faces: how is change to be explained? To his credit, Norris makes capital of this problem on behalf of scientific realists (see especially pp. 37-9). Here is how I would put the matter. Hanson's view comes to this:

> *Constitution*: The worldly objects that science studies are (conceptually) constituted as objects by the language-game (conceptual scheme, rules, theories and practices) that scientists use to study the world.

This thesis, however, is in tension with an empirical fact:

> *Refutation*: The conceptual schemes that science uses to study the world are revis*able* and revis*ed*.

If scientific objects were constructed/constituted by the conceptual resources of theories, would it not be natural to expect that the conceptual resources of the theory would be able to constitute all relevant objects? In particular, how can there be friction *within* the conceptual scheme? Would any friction be either impossible or else explained away by the right constitution of objects? Why, for example, if the relevant scientific objects are constituted by Tycho Brahe's framework, should some phenomena lead scientists to *abandon* this framework? There is a very strong intuition, I think, that the friction can only be explained if the world exerts some *resistance* to our attempts to conceptualise it. This intuition, together with *Refutation*, might be thought enough to refute *Constitution*. But there seems to be a way out for its advocates. It might be argued that the world is indeed there, but only as a structureless (or minimally structured) mould. Yet, this is no improvement. Suppose that the world is a structureless (or minimally structured) mould. We know that the presence of anomalies in scientific theories is *diachronic*. Anomalies do not go away too easily. Sometimes several modifications of our current theory/conceptual scheme have to be tried before we hit upon the one that removes the anomaly. Besides, anomalies do occur in the theories/conceptual schemes that replace the existing ones. If all there were to the world was its being a structureless mould, then this recurring friction could not be explained. A structureless mould can be shaped in any way we like. And if it is shaped in a certain way, there is no reason to expect that the shaping will turn out to be inadequate, unless the mould has already, so to speak, a *shape*. If the world has a certain causal structure, then it is easy to explain why some attempts to fix an anomaly are better than others, as well as to explain why some such attempts prove futile. Hence, if we allow the world to enter the picture as the explanation of friction (and of the subsequent replacement of one's preferred phenomenal world), then we'd better also think that this world has already built into it a natural (that is, natural-kind) structure.

Norris rightly notes some affinities between Hanson's and Dummettian

anti-realism (Introduction and Chapter Seven). To be sure, Dummett avoids relativism (since his anti-realist denies perceptual relativism and incommensurability). But he also works with an evidence-bound notion of truth. A key issue in the realism debate, it seems to me, is how exactly the claim of mind-independence should be understood. It is not very helpful to understand mind-independence in terms of some descriptions that facts should satisfy (or in terms of some characteristic that they may possess). That is, to describe the facts as physical (or material) or as non-mental does not help us understand what it is for them to be mind-independent. Consider precisely the case of modern Dummettian verificationists. They do *not* doubt that middle-sized objects are irreducibly physical. Nor do they doubt the reality of unobservable entities. Yet, they render their reality (or existence) mind-dependent in a more sophisticated sense: what there is in the world is determined by what can be known (verified, etc.) to exist. What is at stake is a conception of the world as the ultimate arbiter of our changing and evolving conceptualisations of it. This can be secured by a non-epistemic conception of truth. In particular, a realist should allow for the *possibility of divergence* between what there is and what is certified as existing by a suitable set of conceptualisations, epistemic practices and conditions.

An issue that needs further reflection is whether scientific realism needs the backing of a substantive non-Humean metaphysics, as Norris seems to require in the final chapter of his book. I am not yet persuaded of this. Nonetheless, I think Norris's book offers a first-rate defence of scientific realism against non-sceptical versions of anti-realism. There may be qualms here and there (for instance, one should resist the temptation to align van Fraassen's anti-realism with Dummett's), but the book is full of good arguments and analysis. It gives Hanson's views their due and, by taking issue with his weighty arguments, offers a fresh and compelling defence of scientific realism.