Kuhn's Changing Worlds

By Howard Sankey

Paul Horwich (ed.), *World Changes: Thomas Kuhn and the Nature of Science*. Cambridge: Bradford Books, MIT Press, 1993. Pp. vi + 356. US$47.50 HB, $16.95 PB.

THIS volume of essays relating to the work of Thomas Kuhn contains papers originally presented at a conference at MIT in 1990. There are five essays by philosophers and four by historians, as well as a response by Kuhn. The volume opens with an introduction by Paul Horwich and a testimonial by Carl Hempel. Hempel writes of fruitful collaboration with Kuhn while the two were colleagues at Princeton, and he credits Kuhn with influencing his 'shift from an antinaturalistic stance to a naturalistic one'. The theme of the relation between positivist and historical philosophy of science, which underlies Hempel's mention of a shift of stance, informs several of the papers by philosophers.

This theme sets the tone of the first essay, in which John Earman reveals significant agreement between Kuhn and Rudolf Carnap regarding the non-existence of neutral facts and untranslatability between theories. Earman also places Kuhn's ideas about theory-choice within a Bayesian framework of the kind favoured by Carnap. In the next essay, Michael Friedman argues that the history of philosophy needs the history of science as much as the philosophy of science does. For the project of philosophy since Descartes has largely to be understood as an attempt to come to grips with contemporary science, rather than to show from an external standpoint how science 'mirrors' reality. In the third essay, Ernan McMullin discusses Kuhn's views on rational theory-choice, and notes that Kuhn's major departure from tradition lies not in his view of rationality but in his denial of a correspondence between theory and reality.

The middle four chapters are by historians of science. First John Heilbron tells how some eighteenth-century mathematicians tried to secede from the Royal Society, and discusses historiographical implications of the disciplinary border disputes which lay behind the mutiny. Next Noel

Swerdlow examines initial stirrings of the Scientific Revolution in an oration extolling the virtues of the mathematical sciences by Regiomontanus at Padua in 1464. Then, in a paper combining Kuhnian philosophical themes with examination of nineteenth-century physics, Jed Buchwald shows how experimental practice may proceed on the basis of unarticulated knowledge independent of explicit theory. Lastly, Norton Wise argues in constructivist vein that the rationalist culture of Enlightenment France was based on networks linking key figures such as Lavoisier and Laplace, which were mediated by the use of material and conceptual technologies conceived as balancing instruments.

The final two essays return to the philosophy of science. In a paper on the relation of theory to observation, Nancy Cartwright compares Kuhn's view of how students learn physical laws with Duhem's view of how mathematical laws are tied to concrete facts. On Cartwright's own account, the relation of theoretical concept to reality is, like the relation of moral to fable, 'that of the general to the more specific'. In the last essay, Ian Hacking sets Kuhn's idea of world-change in the context of the theory of natural kinds, and elaborates his earlier proposal that Kuhn's metaphysics be interpreted as nominalist rather than idealist.

In an important respect Kuhn's response is the most interesting contribution to the volume, for it yields insight into the current state of his philosophical thinking. On Kuhn's present view, a scientific theory employs a structured set of natural kind terms which constitutes a lexicon. This structured vocabulary is stored in a mental module, also called a lexicon, which enables scientists to recognise natural kinds. Against Hacking, Kuhn rejects the nominalist view of concept application: rather than a domain of pre-existing objects, the objects classified by concepts are not fully independent of their conceptual scheme. Natural kind terms, moreover, are projectible predicates which involve lawlike generalisations. Rival theories employ conflicting generalisations, which leads to variation in the categorial structures employed by theories. Incompatibility between the natural laws postulated by theories is therefore what lies behind the untranslatability of incommensurable theories.

Kuhn highlights the consequences of incommensurability for the issues of relativism and realism. He rejects the correspondence theory of truth for application to scientific theory, and denies that scientific progress consists in convergence on the truth about reality. Such convergence is precluded, Kuhn suggests, because comparative closeness to truth is unable to be measured for theories not formulable in a common language. Moreover, since theories cannot correspond to reality itself, the classificational structure of a lexicon is not itself able to be true or false. Yet there is a notion of truth applicable within a given lexicon, so that truth is internal to theory. Since the

claims of a theory cannot be formulated in the lexicon of an incommensurable theory, it is not the case that claims true in one theory may be false in another. Thus, by making truth internal to incommensurable theories, Kuhn seeks to avoid making truth relative to theory. Whether this approach succeeds, only time will tell.

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Science, Religion, Belief and Explanation

By Raymond Aaron Younis

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EDDINGTON was fond of drawing analogies between scientists and ichthyologists. The scientist, he believed, is like an ichthyologist who is armed with a two-inch mesh—anything that is smaller than two inches cannot be 'caught' and studied. Yet Eddington also believed that the scientist could hardly conclude on this basis that there is nothing in the 'sea' that is less than two inches in size. Of course, the analogy is intended to convey his belief that there are things which elude the observations of the scientist or to show that the instruments are not quite sophisticated enough at the best of times. Whatever one thinks of such analogies, the relationships between science and religion, scientific beliefs and religious beliefs or explanations have attracted a great deal of attention recently. Weingartner's book is another volume dedicated to an area which 'is not yet investigated sufficiently'. It is a volume that gathers together seven papers presented at an international conference on 'Scientific and Religious Belief' in Salzburg in 1991.

Keith Lehrer distinguishes the propositional attitude in knowledge from attitudes involved in faith (by which he means *religious* faith), though both are belief-dependent. Knowledge, he argues, involves acceptance, that is, a propositional attitude which aims at obtaining truth and avoiding error with regard to the proposition in question. Belief, he argues, may arise out of indifference to the concern with truth, so there seems to be a difference between beliefs in this sense and 'acceptance'. Many forms of *belief* are not concerned with 'truth seeking'. 'Acceptance', then, is closer to scientific attitudes or to propositional attitudes which are 'evidentially determined'. Faith, by contrast, involves beliefs which are stable and remain unaffected by new evidence or information. Knowledge is defined as the undefeated justification of acceptance; faith is defined as belief which is motivated by things such as piety. The content of the belief is not *known* to be correct (e.g., that a merciful God exists). Lehrer concludes that knowledge and faith, however, are not opposed: the acceptance system of the atheist and of the theist do not just consist of the attitude towards the claim that God exists. Each has a *different* view on the question of how trustworthiness is to be gauged; each evaluates propositions differently.

Franz von Kutschera and Gerhard Schurz, respectively, are concerned with reasons for beliefs in the context of causation and how one reasons with rules which are not deterministic. Kutschera defines 'beliefs' as states wherein one believes that a proposition holds or as labels for convictions, suppositions, 'surmises' and so on. He then asks whether they are freely chosen or causally determined. (To be ' freely chosen' means that one 'could have done otherwise'.) Kutschera produces a concept of causation he had developed in an earlier paper: an event (e) causes another event (e1), if the occurrence of e1 is *guaranteed* by the occurrence of e. He then argues that a rational explanation of a form of behaviour is only possible if a causal explanation does not apply (a 'rational explanation ... is only possible if the agent could have done otherwise'). Kutschera argues that freedom is presupposed by our 'normal language' and our 'conceptions'. The norms of rationality, he insists, make sense only if we have the choice of conforming to them.

Schurz emphasises nonmonotonic reasoning as reasonable: for example, given the proposition 'This animal has wings, so it can fly' it is reasonable to infer the proposition 'If an animal has wings, it normally can fly', provided *nothing else* counts as counterevidence and *blocks* the inference. He examines models from artificial intelligence, considers how one can reason with accepted rules in a nonmonotonic way, and argues that nonmonotonic reasoning provides a model of how to deal in computationally simple ways in the absence of probability values with rules which are not deterministic.