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Book review

On the evolution of criteria of theory choice

Anastasios Brenner: *Raison scientifique et valeurs humaines: Essai sur les critères du choix objectif*. Paris: Presses Universitaires de France, 2011, 125 pp, €22 PB

Howard Sankey

Since Kuhn, it has become commonplace to think of the rationality of science in terms of criteria of theory choice. In determining which of competing theories or paradigms to adopt, scientists appeal to a range of standards or norms which must be satisfied for the theory or paradigm to be acceptable on a rational basis. The decision is not algorithmic. It is a deliberative judgement which weighs up and balances criteria against each other. Accuracy, consistency, breadth, simplicity and fruitfulness were the criteria that Kuhn nominated.

But where do the criteria of theory choice come from? This is the central question investigated by Anastasios Brenner in this fascinating study of criteria of theory choice. The criteria are not fixed and eternal, but are instead the result of a process of evolution. Brenner's book brings a historical perspective to bear on the development of the criteria which until now has been lacking.

After an Introduction that characterizes criteria of theory choice and reflects on how to approach the subject, Brenner launches into the topic in earnest. Chapter one is 'Les Apories de la Décision' (the aporias of decision-making). It opens with Kuhn's idea that the criteria are open to multiple interpretation and may enter into conflict with each other. They function as values which guide scientists in their choice of theory rather than rules which dictate that choice. While Kuhn draws attention to the role of such rational values ('valeurs rationnelles'), he says nothing about their provenance (18). Here, Brenner suggests, Kuhn would have done well to draw upon the work of Gaston Bachelard, who investigated changes in values that take place in the course of scientific practice (22). Brenner takes the combination of Kuhn's and Bachelard's treatment of values as the starting-point for his own analysis.

The second chapter is entitled 'Aux Sources du Problème' (to the sources of the problem). It begins with a discussion of the interplay between Kuhn and Hempel around the role of criteria of theory choice. Brenner suggests that Kuhn's endorsement of the criteria of theory choice was a significant concession to positivism (30). He then traces the criteria to the idea of a free choice of hypotheses in Einstein ("le libre choix des hypothèses", 36), as well as the conventionalism of Poincaré and Duhem, in which a role is played by values such as simplicity, beauty and coherence in choice of theory (32-5). From these authors Brenner turns to the role of

simplicity in the phenomenologists, Mach and Kirchhoff, before an intriguing discussion of the value of precision in relation to the idea of the 'positif' in Comte (41-4).

The third chapter is 'Les Valeurs Dans L'Histoire' (the values in history). In this chapter, Brenner subjects the values of exactitude, coherence and predictive power to historical analysis. Exactitude, Brenner says, might be confused with science itself. It is one of the constitutive notions of science (49-50). Brenner traces the appearance of the notion in its modern form back to the founders of modern science, such as Galileo, Descartes and Newton (50-5). If the notion of exactitude seems to be associated with the rise of modern science, the idea of coherence has ancient roots. Brenner traces the idea of coherence to the notion of harmony, which had a long history before modern applications of the notion of coherence to the internal structure of theories (62). Similarly, predictive power has been associated with science from antiquity, as illustrated by Thales' prediction of a solar eclipse (64). However, Brenner notes, an emphasis on the prediction of novel facts, rather than explanation of known facts, did not clearly emerge until later in the development of science (65).

Chapter four is 'Critères de Choix, Critères de Vérité' (criteria of choice, criteria of truth). Brenner notes an interesting connection between the criteria of theory choice and theories of truth. Exactitude tends to go with a correspondence view of truth, internal harmony of theories with a coherence theory of truth, and predictive power fits with a pragmatist conception of truth. Brenner then discusses the relation between the values of simplicity and completeness with truth, before turning to 'La Crise de la Vérité' (the crisis of truth). Taking his point of departure from some negative comments of Nietzsche, Brenner then sympathetically develops ideas about truth of the American pragmatists, before turning in a final section to the logical positivists' treatment of verification and confirmation. Little note is taken of the correspondence theory, which Brenner appears to dismiss as the traditional conception of truth rejected by recent philosophy (87).

Chapter five is 'Le Choix Motivé' (motivated choice). Brenner now turns to an overview of the issues that emerge from his discussion of scientific values. He notes, first, that the role that is now recognized to be played by scientific values reflects a rejection of an older conception of theory and its relation to observation. But while this new role for values has often been associated with general theoretical frameworks such as paradigms and research programmes, Brenner suggests that a more suitable home lies within the notion of styles of reasoning proposed by such authors as Hacking and Crombie (93). He also points out that the list of criteria of theory choice did not become settled until the twentieth century. Though the criteria may now seem to be almost constitutive of science, this is the result of a long evolution that took place within science (98). Moreover, because of the way in which the values evolve as science changes, we can expect new developments in science in time to give rise to new values, some of which may already be apparent in contemporary scientific developments. But the possibility of new values does not mean that the current list will be replaced by another. Instead, Brenner suggests, new

values that arise will be superimposed on existing values, which will be retained by future science (108).

In his Conclusion, Brenner comments that, though the rational values have evolved, there is no absolute system of reference from which we can measure progress (*'Il n'existe pas de système de référence absolu à partir duquel on pourrait mesurer le progrès'*, 110). Brenner notes that the issue of criteria of theory choice leads into the question of truth. But the truth which science yields should not be conceived in abstract terms. Rather, we should think of truth in terms of the process that leads to it, and as not separable from that process. Though Brenner's remarks about truth are not fully developed, they resonate with his sympathetic treatment of pragmatism and verificationism in Chapter four.

Turning now from exposition to appraisal, I must say that I learned a great deal from this book. Kuhn's discussion of the criteria of theory choice says nothing of the historical emergence of the criteria. Brenner's discussion not only establishes that there is a history behind the criteria, but that they arose as a result of evolutionary processes within science itself. But while I found this historical analysis of the origins of the criteria tremendously insightful, I am troubled by a lack of concern shown for a number of central philosophical questions which arise from reflection upon the criteria.

To begin with, I note that the shortest discussion in chapter three relates to the value of predictive power. After mentioning its ancient origins, Brenner limits discussion to a couple of paragraphs on the treatment of prediction by the Vienna Circle and Popper. By comparison with simplicity and exactitude, predictive power receives minimal attention. It is, however, a topic of some historical significance, having figured in the debate between Whewell and Mill in the nineteenth century. More recently, the idea of a predicted novel fact played a central role in critical discussion of the idea of progress as defined in the context of Lakatos's methodology of scientific research programs.

But the reason I wish to focus on the lack of attention to predictive power is not just that it has played an important role within the history of methodological thought. It is rather that if one does attend to the notion of prediction, then an important philosophical problem moves to the fore which is simply overlooked in this book. For one of the points that scientific realists have often made is that novel predictive success lends itself to explanation within a realist framework, and is less convincingly explained within an anti-realist framework. But the debate between scientific realism and anti-realism in the philosophy of science receives no attention in this book.

The reason for this neglect cannot lie in the fact that the project of the book is a historical analysis of the emergence of the values, rather than an investigation of scientific realism. For, as we have seen from his conclusion, Brenner is unable to avoid the question of truth altogether when thinking about the role of the criteria.

The problem of realism may be raised in relation to the criteria of theory choice in a simple manner. Consider a theory which satisfies the criteria of theory choice better than any alternative theory. Because the theory satisfies the criteria, scientists are justified in accepting the theory. But in what way should they accept the theory? Is the theory to be accepted as true, as empirically adequate, as pragmatically useful, or simply as satisfying the criteria? The question of the exact way in which a theory is to be accepted on the basis of satisfying criteria of theory choice leads straight to the problem of realism.

Not only does the book avoid the issue of scientific realism, it also avoids a fundamental question about the rationality of science. Brenner assumes that the criteria of theory choice are constitutive of the rationality of science. But despite historical analysis of the evolution of the criteria, the question of the nature of the justification of such criteria is not addressed. This is a question at the meta-level, a question of meta-methodology, about the justificatory status of particular criteria or values. It is a question that has exercised leading methodologists from Kuhn and Lakatos to Laudan and Worrall. Various proposals have been made about the justificatory basis of epistemic norms, ranging from intuition about particular cases, to empirical facts about reliability, to a foundation in *a priori* principles.

Brenner has performed an invaluable service by providing a historical analysis of the source of the values. But lack of attention to meta-methodological matters leaves a crucial epistemological question unaddressed. For the question is not just whether the criteria of theory choice have evolved, but whether they are themselves justified, and so able to provide scientists with justification in the acceptance of theories that satisfy the criteria. By not even broaching this question, Brenner leaves the most fundamental question about the rationality of science unasked.

In sum, *Raison scientifique et valeurs humaines* provides an excellent historical study of the origins of the criteria of theory choice. By doing so, it provides an invaluable service to the field of scientific methodology. But it fails to consider the implications of the criteria for the question of scientific realism, as well as the meta-methodological question of the nature of the justification of the criteria. Thus, while it provides an insightful account of the historical background of the criteria, it fails even to address fundamental philosophical questions which arise from reflection upon the nature of the criteria.

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