Books Received

PETER ØHRSTRØM and PER HASLE, **From Ancient Ideas to Artificial Intelligence**, Kluwer, Dordrecht, 1995, $ 140 (US), viii + 413 pp. ISBN 0-7923-3586-4

This is an ambitious book: it is not only an introduction to the formalities of temporal logic, but also, as the sub-title is intended to indicate, a survey of the many areas of philosophy and science in which temporal logic has found and is finding application. Formally, the book is well presented and evinces an impressive grasp of the range of the subject. There are discussions of, among other things, the Sea Battle; the Master Argument; medieval treatments of the logic of ampliation, duration, beginning and ceasing: foreknowledge and freedom; Łukasiewicz's and Prior's contributions to the logic of tenses; tense logic and special relativity; counterfactuals and tenses; tenses and modality; tenses and computer science. As an introductory survey, the book will undoubtedly be useful to readers wanting to gain a rapid understanding of part, or all, of its subject-matter; there are also frequent and full references to further literature, and to results which the authors report without themselves proving. The book achieves its aim of comprehensiveness well, but it has to be said that it does so at the cost of some superficiality, especially in the more historical and philosophical passages. A few points here must suffice.

The discussion on the Sea Battle is unfortunately vitiated by the excessive respect paid to Rescher's work on *De Interpretatione*. Rescher attempts, against the natural reading of the text, to foist on Aristotle a realistic view of statements about the future; his work also contains some simple factual errors, such as the claim, innocently accepted by the authors (p.13), that Aristotle's early Arabic commentators interpreted him realistically. The authors are of course aware of the anti-realistic interpretation of Aristotle's argument, but they fail to present the best version of this interpretation. They note, rightly, that Łukasiewicz's three-valued approach will not as such fit Aristotle's text, since Łukasiewicz set the truth-value of a disjunction with neuter disjuncts to neuter. But it is clear that Aristotle, whatever his attitude to the Principle of Bivalence, does not want to abandon the Law of Excluded Middle, so that on an anti-realist construal of his purpose, Aristotle must be held to regard $Fp \vee \neg Fp$ as true, even if, for contingent p, each disjunct lacks a standard truth-value. The authors simply leave the anti-realist approach in an impasse (p. 194), making it look as if that approach,

if it is to be fair to Aristotle, is obliged to adopt a highly counter-intuitive non-truth-functional interpretation of the connectives. What the authors fail to note is that van Fraassen's method of supervaluation can be, and has been, applied to the anti-realist interpretation of Aristotle to yield an indeterministic model of time which does not have these counter-intuitive consequences.

Prior was originally attracted to an anti-realist approach to future contingency, but came to abandon it when he saw the availability of what he called a 'Peircean' model of future truth, according to which all future contingent statements are simply false. This sort of realism about the future is surely unattractive: if one's intuitions about future contingency are realistic at all, one is likely to find more congenial on Ockhamist approach, according to which a particular branch of the endlessly forking future is privileged as representing the actual future, and contingent statements are evaluated absolutely according as they hold or fail to hold on this branch. We know from Prior's informal exposition of the Ockhamist position in *Past, Present and Future* (p. 123) that it was just this kind of realism which he intended to capture in his so-called 'Ockhamist' model; but unfortunately the semantics he gives for that model (pp. 126–7) fail to achieve that objective. This point is well noted by the authors (p. 212), although they are unable, in spite of their study of Prior's unpublished papers, to shed any light on why the failure occurs. The problem is that although Prior indeed talks of an 'actual' assignment of a truth-value to a wff (as opposed to a 'prima facie' assignment, which gives it a truth-value relative to a merely possible history) he does not supply any semantics for 'actual' truth, and instead says that '[a] formula is verified in an Ockhamist model if [sc. and only if] all actual and prima facie assignments in the model give it truth' (ibid.), which renders Fp, contrary to Ockham's intention, true iff LFp. (Whether Fp will also be *false* iff LFp is *false* depends on whether the model presupposes unrestricted Bivalence: Ockham himself did espouse unrestricted Bivalence, of course, but Prior fails to be explicit about this point in his normalization of the Ockhamist model's semantics.) The authors, as I have said, are aware of this difficulty in Prior's exposition, but they are subsequently careless in suggesting (pp. 247, 266) that he does nevertheless succeed in formalizing Ockham's version of realism about the contingent future.

The constraints imposed by the authors' ambitious project inevitably mean that some of the more interesting philosophical issues connected with time and tense get short shrift. Sometimes the authors' concision of approach works well, as instanced by their neat despatch of McTaggart's Paradox. But elsewhere they are too brusque with complex and delicate issues: for

example, the authors simply claim, without argument, that counterfactual dependence itself depends on a prior asymmetry between the open future and fixed past (p. 286) – an issue which cannot be settled by mere fiat. More seriously, the authors' critical comparison between approaches to time which give priority to the A-series and those which give priority to the B-series is rather too laconic to be illuminating: at the end of their discussion, for instance, the authors slip in the claim that only an A-theory can satisfactorily account for the passage of time (p. 256). But the claim receives no support and is anyway puzzling: A-concepts supply temporal *perspective*, but is not obvious that they have any role to play in grounding a notion of temporal *passage* (a notion which is in any case only dubiously coherent). In general the authors' enthusiasm for the A-theory leads them, in my view, to understate the extent to which an A-theory actually depends on a B-theory: for there can surely be no such things as a temporal perspective without the existence of an objective time-order which such a perspective is to be directed.

The authors make brief sortie against those who have queried the very enterprise of tense logic (p. 246), but again the campaign is to quickly over : one gets no adequate sense of the strengths and weaknesses of the opposition, and so cannot assess whether the authors have really scored a victory or not. Here it would have been good if the authors had engaged with the very interesting semantic reservations about the tense-logical project contained in Gareth Evans's posthumously published paper 'Does Tense Logic Rest on a Mistake?' (in his *Collected Papers*). Evans's arguments are not, I think, unanswerable: but they do at least deserve an answer. If the authors had tried to embrace less of the (now vast) field of the formal and philosophical logic of tense, they would no doubt have left fewer avenues for criticism of this sort, and would have been able to satisfy more of the philosophical qualms one feels reading the book: still, there can be no doubt that what they have achieved will be a useful aid to study, and for that they are certainly to be commended.

Richard Gaskin
Arts Building
University of Sussex
University of Michigan