Review for Zentralblatt (Zbl 07101416)

Parent & van der Torre, *Introduction to Deontic Logic and Normative Systems*

For some time, a consensus has existed about what kinds of topic should go into an introductory textbook on classical logic, with modulations according to whether the audience consists of students of mathematics, computer science, or philosophy. Almost the same can now be said for introductions to modal logic. But for deontic logic no such consensus exists. There are some elementary presentations, designed mainly for students of philosophy, chapters in books whose main focus is on modal logic, and review articles in online sources such as the *Stanford Encyclopedia of Philosophy*, but it has remained difficult to find a basic textbook suitable for teaching the subject.

The item under review fills that gap. Based on a course in deontic logic and normative systems given by the authors to students of computing over several years in the University of Luxembourg, it is a no-nonsense book: philosophical discussion is minimized, informal explanation serves to motivate formal articulation, definitions and proofs are given carefully but without undue fuss. It assumes a basic knowledge of classical propositional logic, its proof theory and model theory, but no more.

Three main topics are covered, corresponding roughly to historical order and level of sophistication. All three are considered on both syntactic and semantic levels, but with emphasis more on the semantics.

First, deontic logic as based on formal similarities between 'it is obligatory that' and the monadic alethic modal operator 'it is necessary that'. This gives rise to a family of monadic deontic logics (acronym MDL) with their associated Kripke semantics including, in particular, the deontic system D, which is just the well-known modal system KD with the box operator read as obligation.

Second, dyadic deontic logic (acronym DDL) in a tradition that was initiated by Bengt Hansson, together with a semantics using preferential models allowing for grades of ideality in states of a model. This approach is motivated principally by difficulties that the monadic account has in dealing with conditional obligations in general and especially those where the condition is a violation of another obligation (contrary-to-duty conditional norms). While being more subtle than MDL, it is still inspired by ideas and techniques borrowed from alethic modal logic.

The third topic works with conditional codes (the 'normative systems' of the title) in a manner that was first developed by the second author and the reviewer, known as input/output (acronym I/O) logics. On a formal level, it is motivated by a need to distinguish more adequately truth from normative status, in particular, to avoid treating propositions as automatically obligatory given their truth, as is typical of DDL accounts. On a philosophical level, it avoids attributing truth-values to norms at all. The corresponding semantics is 'operational' rather than 'valuational', but suitable soundness-and-completeness theorems are available for it, just as for the preceding two approaches. This topic receives two chapters, as contrasted with a single chapter for each of MDL and DDL. One chapter sets out the basics of I/O logics without constraints, while the other explores still-evolving and less stable options for filtering excess output that such systems tend to generate in the presence

of conflicting norms, even when those conflicts do not arise from contrary-to-duty conditional obligations.

The text thus progresses gradually in level of sophistication and, with it, of abstraction, to handle deontic notions with diminishing oversimplification, at a pace that should be within the reach of undergraduate students, whether of computing or philosophy.

What aspects of the subject are not covered? The volume does not present any logics that explicitly represent agents, actions, the passage of time, rights or normative powers, all of which have been explored to some extent in the literature. Nor does it enter into the implementation of the logics using a specific proof assistant such as Isabelle/HOL, which has also been explored recently. Within the aspects covered, the book remains on the propositional level without quantifiers in the object language and examines only systems that come equipped with (some kind of) a semantics and (some form of) proof-theory along with a soundness-and-completeness result linking the two. For further developments in areas not covered, readers are pointed to the recent *Handbook of Deontic Logic and Normative Systems*, volume I, ed. D. Gabbay et al (College Publications 2013), a second volume of which is scheduled to appear shortly.

The authors' goal is evidently to provide a basic text that can be studied from cover to cover in the limited time that is usually available for a first course in the subject. In this it succeeds; the reviewer would make it his first choice for such a course when given to computer science students, recommending it also for parallel reading in courses for philosophy students, as its pithy style cuts through the lengthy prose common in some presentations, to pinpoint essential formal features.

Instructors as well as students will be pleased to see that each definition is illustrated by simple examples, often accompanied by an explanatory remark. Diagrams are given wherever helpful; plentiful exercises are supplied at the end of each chapter, with answers to odd-numbered ones. Brief guides to relevant history and literature are appended to each chapter, coordinated with a carefully selected bibliography at the end of the book. The reviewer regrets only the lack of an index.

Reviewer: David Makinson (London)