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Knowledge Contributors

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REVIEW

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The study of epistemic attitudes—in particular knowledge and belief—dates at least back to the Scholasticism of the Middle Ages. The formal study of those attitudes, however, were initiated in the late 1950s and early 1960s in seminal works by H.G. von Wright (*An Essay on Modal Logic*, Amsterdam, North-Holland Publishing Company, 1951) and J. Hintikka (*Knowledge and Belief: An Introduction to the Logic of the Two Notions*, Ithaca, Cornell University Press, 1962). Since then epistemic and doxastic logics have grown into mature disciplines enjoying many important applications in various domains, in particular in philosophy, computer science, game theory, economics and linguistics.

The book under review is based on the conference *Dimensions in Epistemic Logic* hosted by The Danish Network for Philosophical Logic and Its Applications in May 2002 at Roskilde University, Denmark. The aims of the conference (reflected in the current volume) were: (1) to track the history of epistemic logic, (2) to consider important applications of epistemic logic in a variety of fields and (3) to discuss future directions of research in epistemic logic with particular emphasis on “active agenthood” and multi-modal systems.

The book consists of a short Preface and seven papers. The first paper by V.F. Hendrickson, K.F. Jørgensen and S.A. Pedersen entitled “Introduction” is devoted to the presentation of certain distinctive developmental features of epistemic logic which stand out as particularly pertinent to both the research progression and direction as well as the general epistemological and applicational relevance of it. The following

topics are discussed: agent and system, active agenthood, multiple active agents, multi-modalities. Those topics constitute also the features with respect to which the contributions in the volume are organized.

The aim of the next paper “Knowledge, belief, and subjective probability: Outlines of a unified system of epistemic/doxastic logic” by W. Lenzen is to summarize the semantics of (the propositional part of) a unified epistemic/doxastic logic as it has been developed at greater length in the author’s book *Glauben, Wissen und Wahrscheinlichkeit* (Wien, Springer Verlag, 1980) and to use some of these principles for the development of a semi-formal pragmatics of epistemic sentences. It is stressed in the paper that one may elaborate the meaning of epistemic expressions in a way that is largely independent of (and even partly incompatible with) the pragmatic conditions of utterability. Furthermore, the crucial differences between the pragmatics and semantics of epistemic expressions can satisfactorily be explained by means of some general principles of communication. To realize those aims the author sketches the logic (or semantics) of epistemic attitudes belief, knowledge, and conviction and further develops the basic idea of a general pragmatics which can be applied to epistemic utterances.

In the paper by J. Hintikka “A second generation epistemic logic and its general significance”, epistemic logic is considered primarily in relation to its epistemological applications. Those philosophical applications are, in the author’s opinion, incomparably more interesting and significant than the technicalities of epistemic logic that routinely receive attention in books and papers. On the other hand, epistemic logic was created by philosophers just for philosophical purposes.

The paper “Economics and economy in the theory of belief revision” by H. Rott, provides a look at the role that economic or economical considerations may play within logic broadly conceived. The author is asking to what extent economic(al) principles have played a role in the actual development of the AGM paradigm (the name comes from the names of the scientists who created it, namely Alchourrón, Gärdenfors and Makinson) and to what extent such considerations should have been followed. Add that the AGM paradigm is based on the criterion of informational economy. It is taken to be identical with the idea of minimal change and the conservativity principle. Conclusions to which the authors come are rather negative. In particular it is stated that informational economy (conservatism) with respect to beliefs, although widely advertised as the central motivation of belief revision models, turns out not to have played anything like a dominant role in the development of such models. Furthermore, conservatism with respect to revision-guiding preferences has in fact been suggested as a strategy

for iterated belief revision, but it soon turned out to have unwelcome consequences.

The central theme of the next paper “Common knowledge revisited” by R. Fagin, J.Y. Halpern, Y. Moses and M.Y. Vardi is an attempt to resolve the paradox of common knowledge, namely the paradox: Although common knowledge can be shown to be a prerequisite for day-to-day activities of coordination and agreement, common knowledge can also be shown to be unattainable in practice. It is argued that the resolution of this paradox leads to a deeper understanding of the nature of common knowledge and simultaneity and shows once again the importance of the modeling process. In particular, it brings out the importance of the granularity at which the time is modeled and stresses the need to consider the applications for which these notions are being used. It is also shown that by using the notion of event ensembles, one is able to clarify the tight relationship between common knowledge and coordination.

The aim of the paper “Concurrent dynamic epistemic logic” by H.P. van Ditmarsch, W. van der Hoek and B.P. Kooi is to provide a complete axiomatization for an action language of van Ditmarsch, where an action is interpreted as a relation between epistemic states (pointed models) and sets of epistemic states. Hence in the paper a proof system for a dynamic epistemic logic is presented and it is proved to be sound and complete. In this system higher-order information and belief change, and even higher-order belief change can all be elegantly expressed. An overview of the wide range of applications of this language for concrete multiagent system specification is also given.

In the paper “Multimodal reasoning” by J.F. Sowa, a family of nested graph models is defined. They can be specialized and applied to a wide variety of model structures, including Kripke models, situation semantics, temporal models and many variations of them. An important advantage of the defined models is the option of partitioning the reasoning tasks into separate metalevel stages, each of which can be axiomatized in classical first-order logic. Moreover, for most purposes the nested models are computationally more tractable and intuitively more understandable.

In the closing paper “Referential semantics” by R. Wójcicki, a notion of referential semantics is defined and considered. Comments on its relevance to various epistemological issues are given and a theorem that defines the class of logics whose logical constants are definable in terms of interpretations set forth by a referential semantics is proved. This theorem extends a result of Wójcicki (obtained in 1979) from the propositional language to the predicate one.

Papers collected in the volume under review shed more light on the development of epistemic/doxastic logic and demonstrate its relevance for applications in various domains, in particular in philosophy, computer science, game theory and other disciplines utilizing the means and methods of these logics. They indicate also future directions of research with particular emphasis on active agenthood and multi-modal systems.

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