Book Reviews

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Book Review Editor

LEVESQUE, Hector J., and LAKEMEYER, Gerhard. **The Logic of Knowledge Bases.** Cambridge, MA : MIT Press, 2000. 282 p. ISBN 0-262-12232-4.

To get the scary stuff out of the way first: *The Logic of Knowledge Bases* is an in-depth mathematical exploration of foundational issues underlying knowledge bases, "intended for graduate students and researchers in AI [artificial intelligence], database management, logic, or philosophy" (p. xv). The book's value can only be fully appreciated by those readers who are comfortable both with first-order logic and with mathematical proof (e.g., proof by induction). The audience specifically addressed by this volume is thus relatively select.

The book sets out to define a model for representing knowledge and reasoning over collections of propositions. The model is based on standard first-order logic, modified to be more tractable in practical situations and amplified to account for the relationships between a collection of facts represented in a formal language and the human notion of knowledge. For example, their logical language includes "standard names," a set of identifiers for equivalence classes. By partitioning all terms in the semantic space into equivalence classes, all objects are accessible through their standard name. This permits reference to specific objects whose identity is otherwise unspecifiable. As a further example, their logical language, which relates to what is true (or not true) in the world, is amplified to become an epistemic logical language, which relates to what is known (or is not known) to be true in the world.

The first eight of fourteen chapters in the book lay the groundwork of the model (notably, the first chapter constitutes a non-formal, readable, and cogent introduction to knowledge bases)and explore, inter alia, its logical properties, the use of TELL and ASK operations to populate and query the knowledge base, and the concept of only-knowing, in which what is known is all that is known. The remaining six chapters treat relatively independent specialized topics, for example, default reasoning; the extension of only-knowing to only-knowing-about-a-certain-subject-matter and its implications for the concept of (logical, topical) relevance; the expansion of the set of truth values for beliefs to include not only true and false, but also neither-true-nor-false and both-true-and-false; and the relationship of knowledge to (robotic) action.

The material in this text has been used and refined in graduate courses taught by the co-authors. That it is a textbook is reflected in the presence of exercises and bibliographic notes at the end of each chapter. That it has been refined over various course offerings is reflected, for instance, in the fact that when the authors say a proof has been left as an exercise, they mean it, literally. (In other books, the phrase "left as an exercise" appears at times to mean "I don't feel like working this out myself.") The refinement is also evident throughout the book in the clarity of its writing as well as in intentional (and helpful) instances of redundancy. Sometimes the redundancy comes in a succinct, informal statement of a matter that has just been presented formally; sometimes the redundancy comes in an informal summary of the results of the preceding sections of a chapter; sometimes the redundancy comes in the introductory paragraphs of a chapter, situating it in the context of material already covered. The authors successfully strive to help their readers follow along. Furthermore, the book is based on solid principles of information design, with, for example, the right amount of white space per page and the right amount of material per section. It is reasonably free of typographical error.

Whether versed in first-order logic and mathematical proof or not, most readers of this journal can appreciate (or deprecate) a book's index. This one produces some surprises: For one thing, although the book is close to 300 pages long, there are only 107

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terms in the index and only one of them leads to more than a single locator. For another, some of the index entries are adjectives and at least one is a verb. In fact, the index is not one's standard back-of-the-book subject index, but is instead an index to (the definitions of) terms. Such an index is quite useful for a work like this one, but should not be the only index. The absence of a subject index is an unfortunate omission and one of the book's few weaknesses.

Another feature of the book that I find less than helpful is its adoption of a bibliographic reference system based on numerical indicators rather than on author names and dates. Sometimes the authors overcome this weakness by mentioning the author's name and/or supplying a date for the reference in the text, but many references are simply by number. Personal experience suggests that readers are likely to know more under the name-and-date system of bibliographical references because only a limited number of references will be looked up and remembered under the numerical indicator system.

An underlying goal of the book's authors is to describe rigorously the properties of knowledge-based systems capable of common sense reasoning in real time. While some portion of that effort may not be of particular concern even to researchers within knowledge organization (e.g., robotic action), much of it is. Presumably, it will be only the exceptional reader of this review who finds *The Logic of Knowledge Bases* an easy read, and probably in no case would someone find it a fast read. But there are many parts of the book that should prove to be a thought-provoking and rewarding read, provided one is conversant with the basic notions and notations of first-order logic. Thus, despite the restrictedness of the audience to whom the book is explicitly addressed, a considerably larger audience could benefit from spending some thoughtful time among its pages.

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VARET, Gilbert. **La science et son information à l'heure d'Internet [Science, its information, and Internet]**. Paris : Presses universitaires de France, 2000. vii, 169 p. (Collection Science, histoire, société). ISBN 2-13-050994-0.

The work is divided into three parts, entitled roughly Givens, Issues, and Perspectives ("Constats", "Débats", "Perspectives"). [Note that all translations are the reviewer's, and often they should be considered as interpretations rather than direct translations, in order to try to provide better sense in the absence of the text]. Within the three parts are ten chapters, followed by additional notes and a short bibliography. There is no index.

Gilbert Varet is professor emeritus at the Université de Franche-Comté in France. His previous publications include a number of works on bibliography. This work offers a plea for rigour in bibliographic methods as they shift from paper-based to computer technology. At a time when the arrival of the World Wide Web has caused a paradigm shift in information science methods, a reflexion on the subject of what we do and how we do it can be useful. In addition, since information science has never been able to define itself very clearly (we argue and discuss among ourselves, constantly have to justify our existence to the university hierarchies and to the professional community, have difficulty defining the boundaries between ours and related disciplines, and so on), a philosophical reflexion on the subject can help shed some light.

But this work is not really about information science. It does include much discussion of information science issues but from a philosophical and rather abstract point of view. The discussion leans toward computer science. Indeed, the author does not look favourably at all upon information science as a discipline, and after raising a number of issues about it throughout the text, the better to decry it, in the end he denies that it even exists as a science, using the past tense to say in effect that it was barely more than a culture, far removed from the hard sciences, that attempted to branch out from computer science and that lasted for thirty years or so (p. 153). Should he be reminded that hundreds of schools worldwide still offer graduate education in this area?

It is no wonder the author is confused about what we do exactly, when we who work in the field have trouble sorting it out ourselves. Professor Varet may take comfort in the fact that in the ongoing march of