

REVIEW

Cognitive Science, an Introduction, by Neil A. Stillings, Mark H. Feinstein, Jay L. Garfield, Edwina L. Rissland, David A. Rosenbaum, Steven E. Weisler & Lynne Baker-Ward, a Bradford Book, The MIT Press, 533 pp., 1987.

Writing books about Cognitive Science (CS) has always been a rather risky enterprise. Due to the fast developments in this field one rapidly gets the impression that the lifetime of CS-books is rather short. This book forms no exception. *Cognitive Science, an Introduction* is out of date: it was clearly written at a time in which the shift from a symbolic approach to a subsymbolic approach was not yet known to the authors or, at least, not evaluated properly.

Yet the authors were seemingly not totally ignorant about the most recent movements in the field. At well-defined places in the book connectionism is indeed referred to. On p. 192 (Chapter 5 about search, control and learning) the authors write for example: "Today the field of machine learning is extremely active. Much of the work investigates different algorithms and control structures for learning and relies on already understood search and representation techniques. The ideas of numerical adaptation and small, independent knowledge sources or agents have also enjoyed renewed attention in what is now called *connectionist learning*". But that's it: no further word about connectionist learning in this chapter.

Another reference to connectionism is on p. 301 (Chapter 7 about the brain and cognition) where the authors state: "Cognitive psychology has seen a dramatic expansion of efforts to model intellectual activity with elements ("nodes") that interact in neurologically plausible ways (Anderson, 1983; Rumelhart and McClelland, 1986). Such models, by virtue of their great promise, are helping to show how cognition, the major product (if not *raison d'être*) of the brain, can be viewed as arising directly from the basic principles by which the brain operates." Here we get a reference to the main book on connectionism at the time: the PDP-books from 1986 edited by Rumelhart & McClelland (in some circles referred to as "the Connectionist Bible"). But again, the reader is not informed about the precise nature of these models. Above all, it struck me that the authors do not mention this book at all in the last chapter (Chapter 12 on vision), which contains a part on connectionism (the last 10 pages of the book) - mainly a discussion of the interactive activation model for

letter perception (one of the first PDP models by Rumelhart and McClelland from 1981).

All this suggests that the authors were indeed aware that something was happening in CS although they probably underestimated the impact of connectionism. A proper evaluation of the connectionist literature available would at least have influenced the authors for main parts of this book. Chapter 8, for example, on the foundations of CS, is now based on the symbol processing approach and the representational theory put forward by authors as Fodor, Phylyshyn and others. One would at least have expected some discussion about, say, the foundation of symbol systems on subsymbolic systems. Chapter 2, on the architecture of the mind is about propositional schemata models: extremely important in some fields but now old-fashioned in other domains.

Fortunately this book has some positive points as well. The main attractive point is the way in which the diversity of CS has been treated in a coherent way, mainly based on the distinction between five main areas of research that are said to make up CS: Cognitive Psychology (with emphasis on experimentation), Artificial Intelligence (with emphasis on knowledge, representation, search, control and learning), Linguistics (with emphasis on the representation and processing of natural language), Neuroscience (with emphasis on vision) and Philosophy (for the foundations of CS). The authors have been able to present a number of often very technical and highly formalized models in a well-written text without much logical and/or mathematical machinery. Readers not familiar with formal methods, but interested in CS, will highly appreciate this. This book gives a good introduction to CS up to the beginning of the eighties and I would suggest it to anyone who wanted to know something about CS up to this period. Readers interested in connectionist CS better look out for other introductory books.

Marc Leman

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Michael Redhead, *Incompleteness, Nonlocality, and Realism. A Prolegomenon to the Philosophy of Quantum Mechanics*. Oxford: Clarendon Press, 1987.

Henry Krips, *The Metaphysics of Quantum Theory*. Oxford: Clarendon Press, 1987.

Harvey R. Brown and Rom Harré (eds.), *Philosophical Foundations of Quantum Field Theory*. Oxford: Clarendon Press, 1988.