AI Magazine Volume 14 Number 2 (1993) (© AAAI)

Book Reviews

The Philosophy of Artificial Intelligence

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The Philosophy of Artificial Intelligence, Margaret A. Boden, ed., Oxford Readings in Philosophy, Oxford University Press, New York, New York, 1990, 460 pp., $14.95, ISBN 0-19-824854-7 (paper).

In the introduction to this anthology, Boden defines the philosophy of AI broadly "as the science of intelligence in general—or, more accurately, as the intellectual core of cognitive science." Through this comprehensive definition, she embraces the definitional extremes, including those that traditionally view AI "as the study of how to build and/or program computers to enable them to do the sorts of things that minds can do" and those that make no reference to the computer at all. This collection, however, focuses on the philosophical problems associated with the machine metaphor and asks whether machine intelligence is possible.

For those already familiar with the literature, this volume provides a handy compendium. For students, it provides a concise overview of the machine intelligence debate. The first essays lay the foundation for the discussion that follows. These essays include "A Logical Calculus of the Ideas Immanent in Nervous Activity" by Warren S. McCulloch and Walter H. Pitts, "Computing Machinery and Intelligence" by Alan M. Turing, and "Computing Science as Empirical Inquiry: Symbols and Search" by Allen Newell and Herbert Simon.

The remaining essays deal primarily with three types of criticism inspired by Turing's paper and the belief "that intelligence necessarily involves causal processes (computations) of a certain systematic sort." Antibehaviorist criticisms form the first type. They "appeal to conscious experience as a necessary condition of mentality." The second type argues that "even if a computer were to perform as Turing imagined..., it would not really think or understand: no intelligence without intentionality." John Searle's intentionality critique "Minds, Brains, and Programs" with its Chinese room represents this type. The third type argues the impossibility of getting "computers to perform in a way that matches the depth, range, and flexibility of human minds." Included in this group are David C. Marr's "Artificial Intelligence: A Personal View," Daniel C. Dennett's "Cognitive Wheels: The Frame Problem of AI," and Drew McDermott's "A Critique of Pure Reason."

Connectionist AI papers are placed with this last group. Essays include "Distributed Representations" by

Geoffrey Hinton, James McClelland, and David Rumelhart; "Connectionism, Competence, and Explanation" by Andy Clark; "The Connectionist Construction of Concepts" by Adrian Cussins; and "Some Reductive Strategies in Cognitive Neurobiology" by Paul M. Churchland. Finally, representing the phenomenalist critique of AI, Boden includes "Making a Mind versus Modelling the Brain: Artificial Intelligence Back at the Branch Point" by the brothers Hubert and Stuart Dreyfus.

Conspicuous by their absence are essays by Jerry Fodor and Hilary Putnam (before and after his apostasy). Also missing is a discussion of the philosophy of mind in the twentieth century, which would provide a much-needed context for this collection. Certainly, the contributions of Gottlob Frege, Bertrand Russell, Alfred North Whitehead, and Ludwig Wittgenstein (early and later) deserve mention. Fortunately, there is an excellent survey available in William Bechtel's *Philosophy of Mind: An Overview for Cognitive Science* (Hillsdale, N.J.: Lawrence Erlbaum, 1988). Some discussion of the machine metaphor would also be helpful. Again, we are fortunate in having a thorough discussion available in Earl R. MacCormac's *A Cognitive Theory of Metaphor* (Cambridge, Mass.: Bradford Books, 1985). An excellent essay on this topic is "The Computational Metaphor and Artificial Intelligence: A Reflective Examination of a Theoretical Falsework" by David M. West and Larry E. Travis (*AI Magazine*, volume 12, number 1, 64–79).

If you are looking for an introduction to the machine intelligence debate, you might want to consider this anthology for your library and classes.

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Books Received

Note: The following books were received by press time. If you would like us to consider your book for review, have your publishers send a review copy to *AI Magazine,* 445 Burgess Drive, Menlo Park, CA 94025. We'll include it in the next books received column. Receipt of a review copy, of course, doesn't guarantee a review!

■ Andrews, James H. *Logic Programming: Operational Semantics and Proof Theory.* New York: Cambridge University Press, 1993. 104 pp. $39.95. ISBN 0-521-43219-7.

■ Beerel, Annabel. *Expert Systems in Business*. New York: Ellis Horwood, 1993. 267 pp., ISBN 0-13-296633-6.

■ Beer, Randall D., Roy Ritzmann, and Thomas McKenna. *Biological Neural Networks in Invertebrate Neuroethology and Robotics*. Boston, Mass.: Academic Press, 1993. 417 pp., ISBN 0-12-084728-0.

■ Cann, Ronnie. *Formal Semantics: An Introduction*. New York: Cambridge University Press, 1993, 344 pp. ISBN 0-521-37463-4.

■ Cawsey, Alison. *Explanation and Interaction.* Cambridge, Mass.: The MIT Press, 1993. 232 pp., ISBN 0-262-03202-3.

■ Clark, Herbert H. *Arenas of Language Use.* Chicago, Ill.: University of Chicago Press, 1993. 438 pp., ISBN 0-226-10782-5.

■ Fox, Barbara A. *Discourse Structure and Anaphora*. Cambridge: Cambridge University Press, 1993. ISBN 0-521-43990-6, 173 pp.

■ Gallant, Stephen J. *Neural Network Learning and Expert Systems*. Cambridge, Mass.: The MIT Press, 1993. 365 pp. ISBN 0-262-07145-2.

■ Horacek, Helmut, and Zock, Michael, editors. *New Concepts in Natural Language Generation: Planning, Realization, and Systems*. London: Pinter Publishers, 1993. 318 pp. ISBN 1-85567-084-4.

■ Hunt, K. J., editor. *Polynomial Methods in Optimal Control and Filtering.* Washington, D.C.: IEEE Computer Society Press, 1993. ISBN 0-86341-295-5.

■ Johansen, P., and Olsen, S., editors. *Theory and Applications of Image Analysis, volume 2. Machine Perception and Artificial Intelligence.* River Edge, N.J.: World Scientific Publishing Co., 1993. 346 pp. $78.00. ISBN 9-8102-0945-2.

■ Levin, Beth, and Pinker, Steven, editors. *Lexical and Conceptual Semantics*. Cambridge, Mass.: Blackwell Publishers, 1993. 244 pp. $21.95. ISBN 1-55786-354-7.

■ Luger, George. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving.* Reading, Mass.: Addison-Wesley, 1993. 740 pp. ISBN 0-8053-4780-1.

■ Meyer, David E., and Kornblum, Sylvan, editors. *Attention and Performance XIV: Synergies in Experimental Psychology, Artificial Intelligence, and Cognitive Neuroscience*. Cambridge, Mass.: The MIT Press, 1993. 915 pp. ISBN 0-262-13284-2.

■ Perez de la Blanca, N.; Santeliau, A.; and Vidal, E., editors. *Pattern Recognition and Image Analysis, volume 1. Machine Perception and Artificial Intelligence*. River Edge, N.J.: World Scientific Publishing Co., 1993. 293 pp. $82.00. ISBN 9-8102-0881-2.

■ Przytula, K. Wojtek, and Viktor K. Prasanna. *Parallel Digital Implementations of Neural Networks*. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1993, 311 pp. ISBN 0-136-49262-8.

■ Ristad, Eric Sven. *The Language Complexity Game.* Cambridge, Mass.: The MIT Press, 1993, 148 pp. ISBN 0-262-18147-9.

■ Saoudi, A.; Nivat, M.; and Wang, P. S., editors. *Parallel Image Processing, volume 4. Machine Perception and Artificial Intelligence*. River Edge, N.J.: World Scientific Publishing Co., 1993. 467 pp. ISBN 9-8102-1120-1.

■ Skrzypek, J., and Karplus, W., editors. *Neural Networks in Vision and Pattern Recognition, volume 3. Machine Perception and Artificial Intelligence.* River Edge, N.J.: World Scientific Publishing Co., 1993. 205 pp. ISBN 9-8102-1014-0.