BOOK REVIEWS

MARGARET A. BODEN, ***Artificial Intelligence*** and Natural Man, New York: Basic Books, 1977. xiii + 537 pp. $17.50.

This is an introductory survey of the artificial intelligence (*AI*) research program, presupposing no technical knowledge of computers, psychology or philosophy, but leading the reader to a fairly advanced and sophisticated understanding of the goals, assumptions and results in the field to date. Boden's execution of this modest but far from trivial task has all the virtues appropriate to it. It is accurate, compendious, clear, unbiased, and very well organized. Moving back and forth between quite detailed analyses of program features and general surveys and characterizations, Boden provides an account of virtually every program, researcher, and issue to have been deemed important in this young field. From McCarthy's LISP and Newell, Simon and Shaw's GPS to Minsky, Colby, Schank, Winograd, Marr and a host of other very recent work, Boden explains the aspirations and methods and describes the performance strengths and weaknesses. All the questions that puzzle outsiders get at least introductory and often quite insightful discussion: what is the relation between languages like LISP and machine code, what is the procedural/declarative controversy, the analog/digital controversy, what is a push-down stack, heuristic program, compiler, interpreter, demon or garbage collector?

Boden has taken extraordinary pains to make the book pedagogically effective. At its best, this effort yields fine results. For instance, Boden wisely begins by leading the reader step by step in great detail through a relatively simple but flashy program of Colby's. Only considerations of pedagogical strategy could justify focussing on this program, which is not important conceptually as psychology or computer science (and certainly not as philosophy), but the detail presented there is then put to very good use, and built upon, throughout the book, so that by Chapter 12 Boden has demythologized the field and can wield the jargon with the well justified expectation that her readers can not only get the gist of what she is saying, but know with some precision what the issues are and are not. Similarly, Boden introduces the work on natural language comprehension before turning to the work on vision, with the side benefit of being able to rely on distinctions—e.g., between syntax and semantics as *AI* people understand it—that otherwise would have at best a forced and confusing application to the problems encountered in the vision work. At its worst, Boden's pedagogy turns gimmicky and cute, and one gets the impression that not only has she set out to write a book that any bright twelve-year-old can understand (and probably succeeded) but forgotten that such twelve-year-olds will not be the book's primary audience.

The book is deliberately simple, not only in exposition, but in aspiration. Boden does not attempt to provide a deep view of the field, but the deep views currently available are all controversial at best, and treacherous reading for the neophyte. The evenhandedness with which Boden discusses the various heroes and ogres of this remarkably cliquish field will enrage many knowing readers, who will be ready to dismiss any author who takes those charlatans *X* or *Y* or *Z* seriously, but on close reading Boden can be seen to meet out criticism judiciously, point to more weaknesses than the more strident critics have noticed, and give the various devils their due. She is not quite *neutral* about the importance of *AI*—she chose to write the book—but not a mere enthusiast either. Her discussion of Dreyfus' criticisms, for instance, while somewhat superficial, is calm, fair, and touches on all the essential points with clarity. In the concluding chapters on psychological, philosophical and social implications of the field, she not only dutifully catalogues and assesses the dangers and shortcomings that other critics have noted, but adds some valuable caveats of her own. A curious effect of her sympathetic portrayal of the field might well be that she ends up doing more to damage the reputation of *AI* than any of the critics—by so obviously doing

justice to it. One is struck in the end by how uninspiring many of the most heralded "results" are, and when one reflects on many of the lesser products Boden describes, one is apt to conclude that people in *AI* have a low threshold for being impressed.

Boden is a philosopher, but there is very little explicit philosophical discussion, and few philosophical claims of any moment. The exposition is philosophically sound, however, in a way one seldom encounters in such books when they are written by non-philosophers. At times the philosophical reticence is tantalizing. Boden *reveals*—but does not discuss or analyze in depth—the vertigo of interpretation that seems always to accompany the juxtaposition of mentalistic and mechanistic descriptions of programs. That is, she is very good at portraying the essential *blindness* of programs, and while she gives the reader grounds for drawing the conclusion that this blindness is not only compatible with mentalistic interpretation but the *sine qua non* of an explanatory psychological theory (even a theory of sight—especially a theory of sight), she does not develop these ideas to the point where they confront one's residual suspicions. "They must be leaving something out" is the leitmotif of most skepticism towards *AI*, and she does not address it aggressively.

A concluding, central claim of Boden's is that *AI*, far from "dehumanizing" psychology and threatening man's self-image, is a profound enemy of those tendencies in current thinking, and in this I concur. Nothing has more dramatically demonstrated the poverty of behaviorism and other relatively simple-minded mechanistic visions of psychology than the complexity of *AI's* clearly *inadequate* models. Psychology, if it is possible at all, will eventually show us that our minds are structures of staggering complexity but also elegance. *AI* may not lead us to that psychological theory, but no other approach currently holds out better hope. *Daniel C. Dennett, Tufts University*

THOMAS S. KUHN. ***The Essential Tension*** Chicago: The University of Chicago Press, 1977. xxiii + 351 pp. $18.50.

This book contains sixteen essays and a rather extensive preface. The essays are divided into two groups: historiographic and metahistorical studies. Of the sixteen essays, only two have not been previously published, and the book "is very nearly a version in the original English of the German volume published under the supervision of" Lorenz Kruger (*i*). [*Die Entstehung des Neuen: Studien zur Struktur der Wissenschaftsgeschichte* (Frankfurt, 1977).]

The foremost and almost entire significance of this book is historical. Almost all of the essays have already been published, and the two unpublished essays, "The Relations between the History and Philosophy of Science" and "Objectivity, Value Judgment, and Theory Choice" were written in 1968 and 1973 respectively, albeit the former was revised in 1976. In addition, only the latter of these two unpublished essays is of current philosophical interest—even Kuhn admits that the former is mostly outdated. Although the overall value of the book would have been enhanced with the addition of several more unpublished and current essays, the fact that the work is almost entirely of historical interest does not make it unworthwhile. Kuhn, himself, warrants historical study; he, more than anyone else has been responsible for the general shift among contemporary philosophers of science in thinking that history of science is both relevant and central to their work in philosophy of science.

The lengthy preface is Kuhn on Kuhn, and is one of the most interesting sections of the book. Some of the more important historical points raised by Kuhn about the development of his view of science are as follows:

1. Kuhn actually came upon his view that scientific growth and change involves conceptual revolutions through reflecting upon the personal difficulties he faced in his initial encounter with the history of science. In 1947 when Kuhn was preparing a set of lectures on the origin of 17th century mechanics, he was having a difficult time understanding Aristotelean physics—at least in a manner such that Aristotle could