

environments associated with the precise locations in phase space of all the molecules in the gas would not, I believe, allow a satisfactory non-equilibrium statistical mechanics to be developed. It also involves, as Shimony stresses, an arbitrary metrical assumption, and furthermore gives counter-intuitive assignments of large entropies to some orderly arrangements of molecules in phase space. This is Carnap's S^{**} , which thus appears unsatisfactory as an explication of physical entropy as well as inadequate for the purposes of inductive logic.

Finally, a word about Gibbs and his use of ensemble averages to represent thermodynamic quantities. Carnap again attacks Gibbs for introducing what he calls logical as opposed to objective physical notions, and for arbitrary coarse-graining techniques in defining entropy. As Shimony remarks, it is a pity that Jaynes's information-theoretic version of Gibbs's approach was not available when these essays were written to provide a sharper focus for these strictures.

In summary, the book is disappointing with regard to both physics and inductive logic. Carnap's talent for technical elaboration is misapplied in respect of illusory goals and deficient physical insight.

MICHAEL REDHEAD

Knowledge and Science. By H. KANNEGIESSER. (Macmillan. 1978. Pp. viii+126. Price £6.95.)

The first thing to note about this short book is that the title gives little indication of the contents. A more apt title would have been "Instrumentalism and Dewey's Philosophy of Science". The first main chapter contains some remarks about the nature of instrumentalism in general. Instrumentalism is now normally understood, in a fairly narrow sense, as the doctrine that theoretical scientific language does not aspire to be descriptive, but is merely predictive machinery. However, the author uses it as a blanket term (or in his words, as a term for a number of doctrines held together by a family resemblance) for any doctrine related to the view that "science is the result of man's interaction with his environment" (p. 39) and lists twelve such doctrines ranging from the pragmatic theories of meaning and truth to the idea that method is more important than subject matter (for what, it is not made very clear). In the second main chapter the author sets out to give a "brief examination of the historical antecedents of instrumentalism" (p. 37). As an exercise in the genealogy of ideas this is somewhat less than successful. The author quotes a number of Greek thinkers who indicate little more than a vague empiricism. There is then an enormous leap to the nineteenth century filled only by very brief references to Agricola, Vesalius and Bacon. No adequate history of instrumentalism could really get by without a discussion of Hume's positivism, Berkeley's critique of Newton, or Kant's notion of the regulative function of an idea (which the author in fact mentions on p. 22). By contrast, some thirteen nineteenth-century thinkers with instrumentalist leanings are mentioned or discussed.

Throughout these sections I found what philosophical discussion there was somewhat superficial. For example, as James said (and as Kannegiesser reports on p. 4) the pragmatic theory of truth is central to any form of instrumentalism. Despite this and the author's avowal that an aim of the book is to "justify the choice of [those] ideas and theories [which are members of the instrumentalist family]" (p. vii), the closest we get to a discussion of the problems facing the theory is: ". . . it should be noted that [instrumentalist accounts of truth] have been heavily criticized and have encountered a number of philosophical difficulties but . . . have proved useful in science. Scientists do tend in practice to accept a scientific theory if it fits within the framework of what is already believed without too much re-allocation or re-arrangement

of fundamental laws, and if it "works"; that is, produces predictions of future behaviour within the limits of accuracy of the measuring instruments available" (p. 60). (On its most plausible interpretation this passage seems to identify truth with usefulness and therefore in any case to beg the question.) Moreover, some central problems concerning instrumentalist doctrines receive no discussion at all. Thus in the section on meaning (pp. 13-4) the author describes Peirce's account of meaning and then concludes: ". . . many Instrumentalists have felt obliged to incorporate some form of a pragmatic theory of meaning into their system of thought, but, as would be expected, have therefore had to accept a host of philosophical problems". The host, however, is not even indicated, let alone discussed.

The last two chapters of the book are basically an exposition of Dewey's instrumentalist approach to science, and it is mainly here that what value the book has lies. Dewey is a somewhat ignored philosopher at the present time, and it is not particularly easy for someone without much philosophical education to find out about him. Dewey's own works do not make easy reading and although there are many excellent secondary sources (e.g., H. S. Thayer's *Meaning and Action*) none of them is really suitable for the philosophical novice, nor does any of them concentrate on Dewey's philosophy of science. There is therefore a useful role to be filled by a book such as this, which provides a short and simple introduction to Dewey's philosophy of science. Once again, though, when the philosophical action gets tough the book gives little help. For example, according to Dewey, inquiry transforms a doubtful situation into a satisfactory one. Dewey emphasizes however that the doubtfulness (and satisfactoriness) are objective features of the situation and not psychological states of the investigator. This prevents Dewey's account from lapsing into subjectivism but, as Kannegiesser points out, presents us with the awkward problem of explaining what it is for a situation *per se* to be doubtful. Kannegiesser suggests that a doubtful situation is one which would evoke doubts in the mind of any normal organism in that situation (p. 76). However, this allows the account of enquiry to lapse back into subjectivism: the most effective form of inquiry, of removing doubt, would be a good dose of heroin.

In general, I felt that the exposition of Dewey's ideas would have been improved had they been thrown into relief by comparing them with more modern philosophers of science. For example, Popper and Dewey obviously have a great deal in common: fallibilism, hypothetico-deductivism and the rejection of a theory-independent observation language. The crucial difference between the two is Popper's realism. A discussion of the similarities and the differences could have been most illuminating. Similarly a comparison of Dewey with Kuhn, who also sees science as essentially a problem-solving inquiry, would have been useful, especially since it would have forced the author to spell out in some detail what sort of account Dewey would have given of the growth of scientific knowledge. This is perhaps the central problem in contemporary philosophy of science and one which has always presented particular trouble for instrumentalists.

In summary then, Kannegiesser's book may be a useful introduction for students who know little about Dewey, but when the real philosophy starts it will have to be put away.

GRAHAM PRIEST

Persons and Minds. By JOSEPH MARGOLIS. (Dordrecht: Reidel. 1978. Pp. viii+301. Price \$26.00, paper \$11.95.)

The sub-title of this book is: *The Prospects of Non-reductive Materialism*. Margolis assumes that some form of materialism will yield the best answer to problems to do with persons and the relation of mind and body, and so concentrates his attention on the most promising recent versions. His strategy is to bring out the problems facing