

exception, entirely phenomenological, i.e., related to the interpretation of experiment in terms of parameters rather than with the prediction of the properties of systems in terms of the presumed known properties of the constituent molecules and ions. The remaining seven chapters deal with a survey of available data. No reference is made to Fuoss' work on bolaform electrolytes, to Wall's measurements of ion association to polyelectrolytes, of Scatchard's or Klotz's studies of protein-ion interactions, etc. In keeping with the phenomenological approach adopted, no mention is made of the Kirkwood-Westheimer theory of secondary dissociation, and Gilkerson's theory of ion-pairing is glossed over with a single reference.

To sum up, the author has compiled an immense amount of data concerned with electrolyte dissociation in very simple systems, but he has not made any attempt at consistent interpretation of the data in molecular terms. For a very few specialists this text will probably have value as a reference. However, the lack of any over-all theoretical interpretation and the abbreviated nature of the phenomenological theory presented will severely limit its utility to the student.

**Free-Will and Determinism.** By Allan M. Munn. 218 pp. U. of Toronto Press, Toronto, 1960. \$6.00. *Reviewed by R. Bruce Lindsay, Brown University.*

SOME current schools of thought hold the view that modern physics, through quantum mechanics with its indeterminacy principle, provides a bias in favor of freedom of the will of man as against rigid determinism. This is in spite of the fact that competent physicists have been unable to see any relevant connection. Professor Munn, in the present volume, takes another crack at the problem. It must straightway be confessed that his conclusion at the end of the book reduces essentially to the conviction that indeterminism in physics merely admits the possibility of free will. It is unlikely that most physicists will be impressed with this result. What the philosophers will make of it, the reviewer does not presume to predict.

In the course of his argument, the author devotes about half of the book to a review of determinism in classical and modern physics. The treatment is marred by a failure to distinguish between the concepts of causality and determinism. But a more important difficulty is that purely pedagogical one that the discussion of quantum mechanics in particular is encumbered by a mathematical analysis which is not sufficiently rigorous and detailed to be of any value to the student competent in physics and mathematics, and which, at the same time, will be more or less unintelligible to the intelligent layman for whom the book is presumably intended, but who will almost certainly get lost long before he reaches the end of the trail. The volume also contains numerous stylistic blemishes, such as, for example, *cognito* in place of *cogito* in Descartes' famous dictum, *homesostatis* in place of *homeostasis*, etc., together with many mis-

spellings of proper names. These will unfortunately distract the attention of the careful reader who would like to understand what the author is trying to say. The use of the book for any reference purpose is rendered difficult by the absence of an index.

**The Impact of Atomic Energy.** By Erwin N. Hiebert. 302 pp. Faith and Life Press, Newton, Kansas, 1961. \$4.00. *Reviewed by Alice K. Smith.*

WRITTEN for the Peace and Social Concerns Committee of the Mennonite Church, this book offers the thoughtful nonscientist a survey of the milestones in the military and peaceful applications of atomic energy and an account of how politicians, scientists, and church groups have responded to the practical and moral problems of control over the past fifteen years. Since no such comprehensive study has hitherto been attempted, scientists and others familiar with the field should also find this catalogue of events and points of view extremely useful, although they will need to check on the accuracy of minor points and to look elsewhere for profound and thorough analyses of scientists' reactions. Religious groups, it seems, have been scarcely less generous in making pronouncements about the dangers of atomic energy than the scientists themselves, and with about as much effect in curbing the nuclear arms race. In fact, the only case where the influence of a religious point of view upon official policy is clearly evident was when Thomas E. Murray, as a member of the Atomic Energy Commission from 1950 to 1957, explicitly used the argument of a "just" war in support of a limited nuclear arsenal to maintain the struggle against communism. Professor Hiebert himself espouses the position of nonviolence and believes that Christians should try to convince others of the validity of this stand, while encouraging scientists to work out the technical requirements of methods of control. "The Christian," he concludes, "may well believe that science without religion cannot see what needs to be done. But religion without science has not the power to do it." That this would be an alliance of men of good will, few would deny, but it still leaves unanswered the vital question of how scientists and Christians, as citizens and as policy makers, are to translate their yearning for peace into political reality.

**Automat und Mensch.** Über menschliche und maschinelle Intelligenz. By Karl Steinbuch. 253 pp. Springer-Verlag, Berlin, 1961. DM 28.50. *Reviewed by Walter G. Mayer, Michigan State University.*

THIS book states the personal convictions of the author concerning the relationship between the "intelligence" of programmed mechanical devices and that of the human mind. Thought processes are to be explained by ordinary physics. "I believe that we are able to analyze the functions of the mind as rationally as we can our metabolism or the motion of our muscles," is a statement found early in the book.