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not sure that I recognize it when I see it. Thus, I feel very inadequate as a reviewer.

Ordinarily, I am against polls and sampling, but in this case I felt justified in consulting others. Two very intelligent and original men commended the book, partly, I believe, because the mode and course of thought paralleled their own. One hardheaded but original man was bored. He would have been pleased with something more substantial and more immediately useful. With some self-doubt and trepidation, I will add my own impressions.

This book says a great deal about the representation of machines, in a very general sense that includes practically everything, by matrices and kinematic graphs or state diagrams. It discusses determinate machines, machines with input, stability, black boxes and the possibility of finding the rules of their behavior, Markovian machines, variety and information theory, and problems of error correction and regulation. In doing this it provides, as in the diagrams and tables representing machines, very useful intellectual tools. It provides also a wealth of entertaining examples or problems in the English style, together with answers which are presumably mostly correct. A person who likes to work puzzles could be hugely entertained by working out any or all of these examples. A person with the interest and diligence to do so would certainly gain a great deal of understanding, and a good deal of skill both in thinking along useful lines and in acquiring and using useful results, such as those of information theory.

The book has two weaknesses. One is that, when the notation has been explained and examples have been given, and when we expect that powerful theorems will be proved, instead, we pass on to something else. This reminds me a little of the eminent American educator who was said to have conducted young ladies into the suburbs of literature—and left them there. The other weakness is that sometimes concepts which are important and not without difficulty are thrown at the reader without words or examples adequate to orient his thinking. This happens in the case of normal coordinates, on page 101.

The last chapters, leading up to the "amplification of intelligence", are admittedly speculative.

Ashby's preface addresses his book to physiologists, psychologists, and sociologists. I would think that a good deal of the information and modes of thought in the book could be of considerable use to them. Indeed, Ashby may well lead his fellows to the Promised Land.

Les Dislocations. By J. Friedel. 314 pp. Gauthier-Villars, Paris, France, 1956. Clothbound \$11.05; paperbound \$10.20. Reviewed by R. Smoluchowski, *Carnegie Institute of Technology*.

Anyone who has had contact with the theory of dislocations has been awaiting with great interest the appearance of the recent book on dislocations by Friedel. Not only is the author well known for his many fundamental contributions to theory of solids and to the the-



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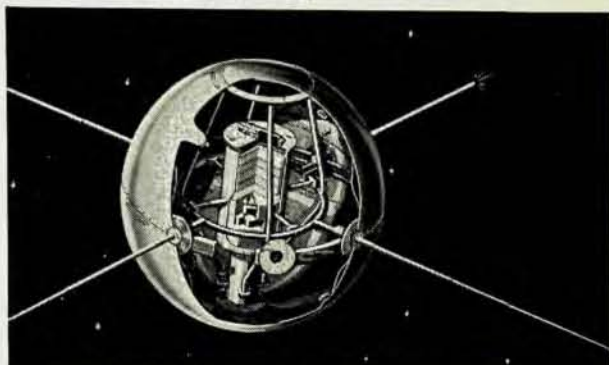
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ory of dislocations, but also the only two existing books on the subject are nearly four years old. The book lives up entirely to the expectations. It is directed essentially to graduate engineering students and to experimental physicists. Numerous more subtle mathematical aspects of theory of dislocations are omitted and instead simple models and qualitative or "order of magnitude" arguments are used. Accent is placed on these aspects of the dislocation theory which are rather well established and developed. Thus such interesting but not yet well-understood phenomena as internal friction and fatigue are only briefly referred to. The book abounds in excellent illustrations, and—for a European book—it has a surprisingly good subject index. Nearly 600 references.

The first part of the book deals with the general theory of dislocations. It starts with simple definitions, with the elastic theory of stationary dislocations and the forces between them. The third chapter is concerned with the motion of dislocations, its experimental evidence, the Peierls-Nabarro forces, etc. This is followed by a short, very good chapter on vacancies and interstitials. Next chapter discusses the climbing motion of dislocations. The longest chapter of all is the next one devoted to partial dislocations, stacking faults, Cottrell dislocations, twinning, etc. The last chapter of this part of the book deals with the spectacular subject of crystal growth as affected by dislocations.

The second part of the book deals with assemblies of dislocations. The first chapter covers such basic concepts as the Frank networks, polygonization, Frank-Read sources, and so on. The difficult subject of cold work and strain hardening is treated in the next chapter and this is followed by a discussion of recovery, recrystallization, and grain boundaries. The various models and theories of creep are considered next and this part of the book ends with a discussion of the mechanisms of cleavage.

In the third and last part of the book attention is directed to interaction of dislocations with other lattice defects. To begin with, the various kinds of interactions, elastic, electrostatic, etc., are discussed and this is followed by a chapter on hardness as affected by uniformly distributed impurities: preprecipitates, precipitates, solid solutions, etc. Next chapter deals with the formation and movement of localized impurity "clouds" and their effect on strain aging, microcreep, Luder band formation, blue brittleness, etc. The last chapter finally deals with the influence of dislocations on x-ray diffraction, optical absorption, conductivity, and magnetic saturation. The book closes with four appendices: on fundamentals of elasticity, a table of physical properties of elements, a table of slip and twinning systems in various metals and, finally, a short French-English-German glossary of technical terms.

A brief glance at the above survey of topics treated in this book indicates the great diversity and richness of subject matter. In fact, there are several chapters which deal with questions never before treated in book form. Probably the greatest value of the book is that it brings together so many new topics usually found

only in original papers. It summarizes also for the first time many developments which occurred during the last few years. These advantages are partly offset by the great conciseness with which the book is written. While reading it, one wishes often that the author had said more about many of the interesting topics he is discussing; in fact, one wishes that this excellent book were at least twice as long! Let us hope that it will be soon translated into English.

Determinism and Indeterminism in Modern Physics: Historical and Systematic Studies of the Problem of Causality. By Ernst Cassirer. Translated by O. T. Benfey. 227 pp. Yale U. Press, New Haven, Conn., 1956. \$5.00. Reviewed by R. B. Lindsay, *Brown University*.

To the philosopher of science and indeed for that matter to the celebrated man in the street the most fascinating aspect of quantum mechanics seems to be the principle of indeterminacy. Its allurements are an ever-present trap for the unwary, and it probably has given rise to as many popular misconceptions as the special theory of relativity. It is therefore with more than usual warmth that one is inclined to greet the appearance of this too long delayed translation of Cassirer's incisive and dispassionate philosophical examination of the basic postulates of quantum mechanics.

The original German edition appeared in 1936, and it is true that much has happened in quantum mechanics in the past two decades. Recent years have seen a lively argument over its most appropriate physical interpretation. Yet, as Henry Margenau remarks in his preface to the present translation, there remains a genuine timeliness in Cassirer's point of view, and it may be read with profit by those who are puzzled by the present controversies.

The subtitle of the book is "Historical and Systematic Studies of the Problem of Causality", and it is with the fate of causality in modern physics that the author is principally concerned. He begins with an excursion into the historical development of the causal concept, starting with that famous spirit conceived by Laplace in his *Théorie analytique des probabilités*, who possesses complete knowledge of the state of the universe at any given moment and thus has determined for him in exact detail its whole past and future course. Here causality is essentially equated to determinism. This naturally leads on through the skepticism of Hume to the transcendental analysis of Kant.

In order to build up his own interpretation of causality in physics, Cassirer devotes several chapters to a sketch of the broad outline of physical methodology as a logical if somewhat arbitrary process which leads from measurements through laws to principles, a very clear exposition of the fundamental nature of physical theory. He then advances in categorical fashion his own view that causality merely connotes the ultimate possibility of ordering our experiences of nature by means of the process of physical theorizing which he has just

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