of physics are and how relevant the link (or how premature the jump) to psychological concepts is. As an introduction for the nonspecialist, the book flounders on an obstacle common to such an attempt in any science: it fails to make the relevance of the theory to observations plausible.

It would be regrettable if, in spite of these shortcomings, this book were not read. What it deals with is at least a possibly—and to my mind, probably—crucial frontier of *psychology's* development into a unified science. Clinical psychoanalysis is in many ways a self-contained specialty, but psychoanalysis at large *is* psychology. It is a psychology built to account for vital phenomena of human behavior, not tackled by those theories which arose from experiments. Metapsychology holds the promise that it can bring this psychology to a level of theoretical generality where its unification with experimentally derived theories, or at least its experimental verification, will be possible [see *Theoretical Models and Personality Theory,* D. Krech and G. S. Klein, Eds., and *Systematic Resources of Present-Day Psychology,* S. Koch, Ed.]. Though this promise may prove to be an illusion, still it must be given a try. Colby's book is a contribution toward making such a try possible. Its shortcomings cannot be overlooked, but they can be accepted as reflections of the present state of psychoanalytic metapsychology and of psychology at large.

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Recent Advances in Science. Physics and applied mathematics. Morris H. Shamos and George M. Murphy. New York University Press; Interscience, New York, 1956. 384 pp. Illus. $7.50.

This volume includes papers that were presented at a symposium on recent advances in science, held at New York University in the spring of 1954 for representatives of industrial, government, and university laboratories. Although the volume did not appear until nearly 3 years after the symposium, it represents an important addition to the library of review articles in major fields of physics. The contents and distinction of the book are probably best shown by a simple listing of the chapters and their respective authors: "Methods of applied mathematics," Richard Courant; "The future of operations research," Philip M. Morse; "Atomic structure," I. I. Rabi; "Microwave spectroscopy," C. H. Townes; "Nuclear structure and transmutation," H. A. Bethe; "Elementary particles," V. F. Weisskopf; "Electronuclear machines," Leland J. Haworth; "Neutron physics," Norman F. Ramsay; "Transistor physics," William Shockley; "Ferromagnetism," R. M. Bozorth; "Cryogenics; very low temperature physics and engineering," F. G. Brickwedde; and "Physics and the engineer," Edward U. Condon.

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Handbuch der Physik. vol. VII, *Crystal Physics 1.* S. Flügge, Ed. Springer, Berlin, 1955. vii + 687 pp. Illus. DM. 122.50.

Crystal Physics 1 consists of four long articles: "Crystallography," by Heinz Jagodzinski, of Würzburg (103 pages); "Lattice theory of the mechanical and thermal properties of crystals," by Günther Leibfried, of Göttingen (221 pages); "The specific heat of solids," by M. Blackman, of London (58 pages); and "Theory of crystal imperfection," by Alfred Seeger, of Stuttgart (282 pages). These are followed, as is usual in the *Handbuch der Physik,* by subject indexes in German and English. Blackman's article is in English, the other three are in German.

The first article develops the subject of possible crystal lattices from the standpoint of symmetry operations. Tables compare the notations of different authors. Next, the geometric character of the different properties is treated, then the external geometry of crystals. Finally, the connection between chemical formula and crystal structure is discussed from a qualitative standpoint.

Leibfried's article is, so to speak, a new, more profound edition of Born's pioneer work. Although it has not been possible for him to present all the details, Leibfried always gives the fundamental quantum-mechanical equations, which consider the crystal as made up of nuclei and electrons, and indicates how one gets from that point to the coarser treatment which considers whole atoms or ions as the building stones. The different types of energy interactions are described, and the successes and the difficulties that are encountered in explaining why a particular substance has a particular lattice are indicated. Next, the lattice theory of deformation and stresses is given and compared with the continuum expressions. A very useful feature here is the tabulation of constants for simple lattice types (that is, expressions of elastic constants through intermolecular spring constants). The equations of motion from which the lattice vibrations are calculated are a consequence of the preceding theory. Then follows the discussion of the more subtle case of ionic crystals and the coupling between lattice wave and electromagnetic waves, but crystal optics is not treated in detail. The thermodynamic properties are next taken up, and here there is some duplication with the next article. There follows an interesting discussion of the non-Hooke's law terms, which are responsible for heat expansion and thermal conductivity. The lack of a complete theory is emphasized.

Blackman has specialized for many years in calculating the distribution function of lattice vibrations, which governs —although not very sensitively—the specific heat. He develops here the methods which have become recently available but emphasizes that each case demands a separate calculation. In the simplest approximation one uses a Debye function, but, to get agreement with lattice theory and experiment, one must allow the "constant" Debye temperature to vary with temperature. In polyatomic crystals, Blackman always uses, in this approximation, pure Debye functions, not, as is often done, sums of Debye and Einstein functions. Detailed comparison with the experiment are made.

The subject of crystal defects has been developed only in recent years; there exist only a few coherent presentations that are as detailed and extensive as that of Seeger. Crystal defects are divided according to their dimensions into those of zero dimensions—empty lattice places, dislocated atoms—and those of one or two dimensions (dislocations, grain boundaries). The former may be a result of thermal equilibrium, and a detailed treatment is given of their number, heat of formation, and migration (diffusion). Those of the second kind are responsible for the diminished mechanical strength of crystals. They may be line dislocations, which wander under the influence of stresses and produce slip, or screw dislocations, which are important in crystal growth and are, in fact, decisive for the growth of ionic crystals.

In the whole volume, the printing is excellent and there is an abundance of illustrations. These are particularly valuable because so many geometric questions are discussed; in addition, many experimental results are presented graphically, especially in Blackman's article. The proofreading must have been exceptionally careful; I cannot remember having noticed any printing errors.

In one point, at least, some of the articles differ from those in the first two editions of the *Handbuch.* The latter tried to give a complete bibliography of their subject, so that it was sufficient for a research worker to take the *Handbuch* as a starting point and search the literature for only about a year prior to the publication date. Obviously, as a matter of policy, the present encyclopedia treats this problem differently. This is illustrated in the present volume.