is well known in the ceramic field, outside the U.S.S.R. as well as in the Soviet Union.

The book follows the traditional pattern of educational literature intended for ceramists—it is largely directed toward the production of useful products. Although Budnikov deals mostly with technical knowhow, some necessary theory is included.

In part 1, the production and properties of wall, roofing, and facing materials are described. Part 2 deals with the properties and uses of the polyphasic refractories. The techniques for preparing oxide and nonoxide refractories are also treated in this part. Part 3 refers to fine ceramics and includes detailed techniques for the production of such articles as chinaware, electric insulators, faience, and semiporcelain.

The translation is very good. The technical language is accurate, and the diagrams and photographs are better than those in the original Russian edition. Few technical errors can be found in the text. Very few references to foreign literature are mentioned.

The availability of this book gives the Western ceramist a good idea of the level of ceramic engineering in the U.S.S.R. Educators will probably find the book useful in teaching undergraduate courses in ceramic engineering.

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Nuclear-Structure Physics

Unified Theory of Nuclear Models. G. E. Brown. North-Holland, Amsterdam; Interscience (Wiley), New York, 1964. viii + 178 pp. Illus. $7.25.

Nuclear models as rough sculptures of nuclei grew in scope and success throughout a long period of symbiosis with experiment during the 1930's and the 1940's, culminating in the very fruitful extensions of the shell model following the introduction of (jj) coupling and collective deformations in the late 1940's and the early 1950's. Treatments of the coupling of several nucleons yielded satisfactory energy spectra, but configuration interaction was largely neglected.

There followed a new attack, inspired by enthusiasm for the analogy of a closed shell to the vacuum of electrodynamics, and here lies the main emphasis of Brown's book. With a flair for bringing out the main point, Brown presents well the methodology of second quantization in relation to the Hartree-Fock calculation and the great utility of this formalism in dragging in, through the concept of "quasiparticles," as much configuration interaction as may be conveniently associated with individual-particle coordinates. He highlights the preponderant role of pairing matrix elements and the importance of correlations of particle-hole excitations for collective electric moments. He unflinchingly pursues such demanding subjects as the influence of pairing on moments of inertia and the foundation of the optical model without, however, tackling the theory of nuclear matter.

This book is an important and very welcome addition to the literature of nuclear-structure physics, bringing together compactly most of the recent advances. It is a serious book, and for the most part very instructive in a rather unique and penetrating way. Yet the style of the author, which he greatly enjoys as he assures us in the preface, in addition to the very pleasant way that it bridges some conventionally difficult steps, displays an almost gay disregard for the needs of the likely reader at other spots. (One wonders if the class is approaching the end of the hour!) Complete detail about such sophisticated subject matter would of course make a ponderous tome, but it is a pity that a treatment containing so many neat conceptions does not go a little further in pursuit of continuous clarity. Where a discussion is started with a bare formal assumption or where it is later left to appear that an approximation is introduced solely for mathematical convenience, a less than assiduous reader is encouraged to be content with the all-too-common exhilaration of spotty understanding.

Rotations in simple even nuclei are covered, along with their moments of inertia, and the content is so up-to-date that it includes the author's recent interesting idea on the spectrum of excited states of that overworked nucleus, O^{16}, in terms of a deformation resulting from pair excitation in contrast with an undeformed ground state. However, all the "gory details," as he lightly calls them, of the wealth of phenomena accompanying the coupling of particle moments to nuclear rotation (so beautifully developed by his former colleagues at Copenhagen), as well as nuclear-model spectroscopy with vector-coupling schemes by direct matrix diagonalization and the revealing study of nuclei so light that their nucleons can be counted, are relegated to other treatises (or to the dead past!).

Thus, the prospective reader should not be misled by the title into expecting the complete theory of all nuclear models; a book of less than 200 pages could hardly cover them all and still give such deep consideration to some. But if the title is read to imply that the book supplies a sort of mortar (particularly the Hartree-Fock theory) to tie together the various treatments of nuclear models, without a concrete foundation but with the details of some of the most interesting and most modern of them, then the title is not too presumptuous.

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Creativity in Mathematics

Mathematical Discovery. On understanding, learning, and teaching problem solving. vol. 2. George Polya. Wiley, New York, 1965. xxiv + 191 pp. Illus. $5.50.

This second volume, which can be read independently, returns to the theme, "Towards a general method," to which two chapters were devoted in volume 1 [reviewed in *Science* **140**, 886 (1963)].

It soon appears that no single method is available, although one can try, often in very many ways, certain simple procedures that may be helpful. The splitting up of a problem into several stages is illustrated geometrically, and used to evaluate an elementary volume. The usefulness of a *plan*—which amounts to working backwards from the desired aim, whereas the execution proceeds forwards—is illustrated in finding the greater of two numbers, each given as a sum of two square roots. Another procedure that is discussed concerns an auxiliary problem which provides the key to a given one: a chimpanzee sees a banana outside his

cage and beyond his reach, but he also sees a stick that he can use to push the banana within range.

As Polya points out, each procedure depends for its success on some helpful idea, which may flash on us unexpectedly, but more often is long in coming. This leads him to discuss the working of the mind, and how it can be disciplined, and to speculate on other favorite topics, the question whether there are rules of discovery and the role of guessing in the scientific method. In between there is a long and instructive chapter on learning, teaching, and learning teaching, which every teacher should take to heart. It includes 20 pages of notes from which I single out a quotation from Anatole France: "Do not try to satisfy your vanity by teaching a great many things. Awake their curiosity. It is enough to open their minds, do not overload them. Put there just a spark. If there is some good inflammable stuff, it will catch fire."

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Virology

Techniques in Experimental Virology. R. J. G. Harris, Ed. Academic Press, New York, 1964. xiv + 450 pp. Illus. $15.

In the preface to this volume the editor informs us that the book is intended for use in the laboratory rather than in the library. Prospective purchasers of this book are advised that, in my opinion, the main use of this book will be in the library.

The volume is a collection of reviews partially covering the preparation and properties of plant virus proteins, infective viral RNA, assay of plant and animal viruses, insect viruses, purification of animal viruses, serological techniques, electron microscopy, hemagglutination, interference, and tissue culture technique.

My task of reviewing is lightened by the fact that the reviews are, for the most part, collections of references to techniques, with a minimum of advice from the "acknowledged experts" (I borrow the phrase from the dust jacket) to the laboratory worker. There is little that can be said for or against such a compilation of references. To the book's credit, well-written and practically useful discussions are given by Dougherty on animal virus titration technique, by Fiset on serological technique, by Parsons on electron microscopy, and by Sanders on infective RNA from animal viruses.

A chapter by C. H. Knight, on the preparation and properties of plant virus protein, contains a very good but very brief outline of techniques for the preparation of TMV protein. But I doubt if the details of standard biochemical techniques for determining the primary amino acid sequence of a protein warrant three-quarters of the whole chapter.

This raises the question of who are the people for whose use this volume is intended. The editor states that it is for "those galloping enthusiastically into a new field . . ." and "for all virologists . . . for whom the selection of the right technique is as important as the choice of the right wife." The latter, I fancy, is a comparatively small group of virologists. For those trained in formal virology, the volume is deficient in articles as detailed in biochemical techniques as that presented by C. H. Knight; for those venturing into virology for the first time, many of the contributors assume a knowledge of virology so that there is insufficient discussion of such procedures as preparation of virus stocks, single-step growth conditions, and the culture and infection of animal cells.

Noticeably absent in a modern volume of techniques in virology are discussions of the physical and chemical characterization of DNA and RNA, of the application and implication of in vitro RNA-DNA hybridization, of autoradiography, of the preparation of radioactive virus, and of other techniques now used to study the mechanism of viral replication.

Sadly lacking is a well-organized, up-to-date chapter by an acknowledged expert on the culturing of animal cells, surely one of the most important techniques of modern virology. There is indeed a chapter entitled "Tissue culture techniques" which is padded with recipes for some culture media and with brief mention of less frequently employed cell culture methods. However, this chapter says almost nothing of practical value about spinner culture technique or about the subculturing of cells as monolayers. One gains the impression that the author of the chapter in question is not as familiar as he should be with recent developments in his subject or that he is reticent about providing the reader with any useful information.

For those authors who might be in the process of, or even contemplating, writing a book on techniques in experimental virology, this volume should be an encouragement to continue. For those virologists for whom the selection of the right technique is important, this volume will provide some useful references that will help them to start searching the literature.

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Nonlinear Mechanics

The Dynamic Stability of Elastic Systems. V. V. Bolotin. Translated from the Russian edition (Moscow, 1965) by V. I. Weingarten, L. B. Greszcuzuk, K. N. Trirogoff, and K. D. Gallegos. Holden-Day, San Francisco, Calif., 1964. xii + 451 pp. Illus. $12.95.

This translation of Bolotin's monograph provides further access to Russian developments in nonlinear mechanics and emphasizes a specialized class of dynamic stability problems of interest in the design of structures, particularly the more efficient ones. If a compression member such as a strut or column is subjected to a periodic longitudinal force, transverse vibrations in the buckling modes occur for certain values of the disturbing frequency. Specifically, when the disturbing frequency is twice that of a natural frequency of bending vibrations, a so-called parametric resonance occurs. The author examines this problem and the corresponding problems involving curved bars, frames, plates, and other structural forms.

The well-written text, with a pleasing format, is in three parts. In part 1 the Mathieu-Hill equation is discussed, with applications to the straight bar and to modifications thereof. A general treatment of parametrically excited vibrations, and methods for determining frequency boundaries and vibration amplitudes, are given in part 2. Consideration of the more complex structural elements and frames, which reflect the researches and contributions of the author, complete the text.

The mathematical developments are quite elaborate in parts 2 and 3. Alternate methods of analysis, by the