of illustrations; however, the lack of more rigorous treatment does rob the conclusions of some of their force. Browning makes no attempt to integrate populations with related topics, such as community energetics or evolution. One is a bit puzzled by his description of other, less circumscribed works in the field as "alternative points of view." The discussion of human populations, a brief concluding chapter, is less than impressive, and an attempt to put together the pieces of an approach that, by itself, strikes one as unnecessarily atomistic, would have been more useful. This is particularly true with respect to rather exciting advances which have been made during the last few years in attempts at synthesis, but which are not mentioned for lack of space. Within these limitations, however, this is quite a good introduction that can be commended for its care in preparation and its reasonable price.

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Quantum Theory

Quantum Mechanics. vol. 1, *Old Quantum Theory*. Sin-Itiro Tomonaga. Translated from the Japanese by Koshiba. North-Holland, Amsterdam; Interscience (Wiley), New York, 1962. xvi + 313 pp. Illus. $12.50.

It has always been my opinion that the only way to teach physics at the graduate level is by combining a quasi-historical approach with the usual quasi-deductive method. This is especially true in quantum theory, for quantum theory is far from a closed subject and can therefore be appreciated and learned only by following its historical development. Although this is often recognized, it is rarely practiced. In most textbooks the student is led as quickly as possible to the technical mathematical aspects of the theory, since these are easy to teach and, therefore, supposedly easy to absorb! It is a pleasure to see that Tomonaga does *not* follow this example.

In this first volume of a projected three-volume treatise, which is translated from the Japanese, Tomonaga, with great skill and taste, presents the development of the quantum theory from the basic papers of Planck and Einstein through Rutherford's discovery of the atomic nucleus and Bohr's theory of atomic structure to Bohr's correspondence principle and the discovery of the matrix mechanics by Heisenberg. Of course the treatment is quasi-historical. The author says in the preface that he did not intend to write a book on the history of science and that he has arbitrarily rearranged the material to elucidate as clearly as possible the thinking of many geniuses. Of course, not everyone will agree in detail with Tomonaga's arrangement. I would have given more emphasis to the interference experiments and the superposition principle, and I would not have omitted Einstein's 1917 paper on radiation theory. But one must say that in general, the author has been remarkably successful in capturing the real spirit of the development of the quantum theory. I admire especially chapter 5, on the birth of matrix mechanics.

The writing is very clear, and the mathematical apparatus is kept at the irreducible minimum. The book is also self-contained so that it can be used as a text book. In the second volume the author intends to treat, in the same manner, the development of wave mechanics, and the third volume will conclude with a systematic and deductive presentation of the whole theory. If the author fulfills the promise of this first volume, we will finally have a treatise that can be recommended without reservation to the serious student for self study or which could be used admirably in a three-semester course in quantum mechanics.

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Creativity in Mathematics

Mathematical Discovery on Understanding, Learning, and Teaching Problem Solving. vol. 1. George Polya. Wiley, New York, 1962. xv + 216 pp. $4.75.

This is the first of two volumes that will be devoted to problems which require the use of only the rudiments of algebra, geometry, and trigonometry, including some graphing. The object is to teach, to the extent possible at this elementary level, creativity in mathematics.

Among the "brain teasers" treated, we find such problems as that of determining the number of hens and the number of rabbits owned by a farmer who knows that his hens and rabbits have a total of 50 heads and 140 feet. Later problems are gradually directed toward the use of general methods, particularly that of recursion, or induction, and the scope is eventually widened to include crossword puzzles, the thread of Ariadne, preparation for Halloween, and other nonmathematical contexts.

The precise problems are, perhaps, not important; what matters is the challenge that each problem presents, and the manner in which the problem is used to instruct and encourage the student. Thus, several methods for solving the problem of the number of hens and rabbits are given and generalized, and the different approaches are compared with one another. One solution begins with the suggestion that each hen stand on one leg, and each rabbit on its hind legs. Only 70 legs are then in use, and this number is identified with that of the heads of the hens, taken once, together with the heads of the rabbits, taken twice. By subtracting all the heads, taken once, we are left with 20 (heads of) rabbits, and so 30 hens.

Much of the book is directed about equally to gifted students and to their teachers, including the whole hierarchy of teachers of teachers and teachers of teachers of teachers; doubtless the latter category includes parents, if teachers learn anything from their criticism. Indeed, teachers have really far more to learn than their pupils, if the priceless gift of creativity is to be preserved. In this respect, it is typical of the author's delicate handling of minds in the process of developing, that he refers favorably to incorrect guesses, instead of indulging in the traditional caustic comments.

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Physics Textbook

Introductory Atomic Physics. M. Russell Wehr and James A. Richards, Jr. Addison-Wesley, Reading, Mass., 1962. xi + 420 pp. Illus. $8.75.

The authors have attempted to make this book more readable by using a deliberately unpedantic style. I prefer such a style for an introductory text-

book, however, in this one some of the rigor seems to have disappeared with the verbosity. As in many other textbooks, a new concept is sometimes introduced by analogy with a more familiar one. This correlation does no harm and may increase the student's understanding, but in several cases Wehr and Richards have provided very little definition of terms beyond the comparison. In general, they have made the material quite easy to read, and their next edition could be an example of lucid writing for others to emulate.

My principal concern is for the role of a course in a physics curriculum at the college level, for which this text would be suitable. By actual page count, a minimum of 142 pages of text and solved problems duplicates the material in an introductory text that is widely used in liberal arts courses. In this case duplication means that no additional facts, no additional reasons justifying a physical model, or no additional limitations inherent in a physical model are presented.

The new material presented in the remaining 214 pages (of which many pages are problems that illustrate the text material) seems too little to justify the use of this book as the text for an additional semester or quarter of work beyond the introductory general physics course, even though the advertising cover suggests this possible use for the book. The book does fulfill another purpose stated on its cover—that of providing suitable supplementary reading for an introductory general physics course.

It is to be hoped that the increase in the amount of mathematics taught in high schools will remove the need for college physics textbooks that avoid mathematical description of phenomena. No one has much insight into the scientist's description of the universe unless he understands a little of the algebraic language in which that description is stated.

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New Books

Biological and Medical Sciences

Advances in Carbohydrate Chemistry. vol. 17. Melville L. Wolfrom and R. Stuart Tipson, Eds. Academic Press, New York, 1962. 516 pp. Illus. $16.

Advances in Fluorine Chemistry. vol. 3. M. Stacey, J. C. Tatlow, and A. G. Sharpe, Eds. Butterworth, Washington, D.C., 1963. 287 pp. Illus. $9.95.

Advances in Protein Chemistry. vol. 17. C. B. Anfinsen, Jr., Kenneth Bailey, M. L. Anson, and John T. Edsall, Eds. Academic Press, New York, 1962. 428 pp. Illus. $14.

American Drug Index, 1963. Charles O. Wilson and Tony Everett Jones. Lippincott, Philadelphia, 1963. 829 pp. $6.75.

Analytical Microbiology. Frederick Kavanagh, Ed. Academic Press, New York, 1963. 723 pp. Illus. $22.

Animal Species and Evolution. Ernst Mayr. Harvard Univ. Press, Cambridge, Mass., 1963. 813 pp. Illus. $11.95.

Approaches to the Study of Aphasia. A report of an interdisciplinary conference on aphasia. Charles E. Osgood and Murray S. Miron, Eds. Univ. of Illinois Press, Urbana, 1963. 222 pp. Illus. $5.

An Atlas of Ultrastructure. Johannes A. G. Rhodin. Saunders, Philadelphia, 1963. 236 pp. Illus. $10.

The Bacteria. A treatise on structure and function. vol. 4, *The Physiology of Growth.* I. C. Gunsalus and Roger Y. Stanier, Eds. Academic Press, New York, 1962. 473 pp. Illus. $16.

Biophysics of the Striated Muscle. E. Ernst. Akadémiai Kiadó, Budapest (German edition, 1958), 1963. 398 pp. Illus.

Birth Defects. Morris Fishbein, Ed. Lippincott, Philadelphia, 1963. 351 pp. Illus. $5.

Catalogue of the Type Specimens of Microlepidoptera in the British Museum, Described by Edward Meyrick. vol. 4, *Phaloniidae, Carposinidae, Chlidanotidae, Oecophoridae, Blastobasidae, Momphidae, Epermeniidae, Strepsimanidae, Physoptilidae.* J. F. Gates Clarke. British Museum (Natural History), London, 1963. 525 pp. Illus. £12 10s.

Changing Perspectives on the Genetic Effects of Radiation. James V. Neel. Thomas, Springfield, Ill., 1963. 105 pp. Illus. $5.

Comprehensive Biochemistry. vol. 5, *Carbohydrates.* Marcel Florkin and Elmer H. Stotz, Eds. Elsevier, New York, 1963. 344 pp. Illus. $14.50.

Control Mechanisms in Respiration and Fermentation. A symposium (Woods Hole, Mass.), September 1961. Barbara Wright, Ed. Ronald, New York, 1963. 363 pp. Illus. $10.

Disorders of Carbohydrate Metabolism. Proceedings of a conference (London), March 1962. D. A. Pyke, Ed. Lippincott, Philadelphia, 1962. 256 pp. Illus. Paper.

Drawings of British Plants. Being illustrations of the species of flowering plants growing naturally in the British Isles. Pt. 18, *Compositae.* Stella Ross-Craig. Bell, London, 1963. Unpaged. Plates. Paper, 10s. 6d.

Experimental Chemotherapy. vol. 1. R. J. Schnitzer and Frank Hawking, Eds. Academic Press, New York, 1963. 1024 pp. Illus. Until 31 May, $32, $38.

Experiments in Microbial Physiology and Biochemistry. Gerald R. Seaman. Burgess, Minneapolis, 1963. 106 pp. Illus. $5.

Forest Mensuration and Statistics. Bertram Husch. Ronald, New York, 1963. 482 pp. Illus. $10.

General Biology. A unified text manual. William W. Bloom and Carl H. Krekeler. Van Nostrand, Princeton, N.J. (© 1955), 1963. 501 pp. Illus. Paper, $7.50.

Genetics and Dental Health. Proceedings of an international symposium (Bethesda, Md.), April 1961. Carl J. Witkop, Jr., Ed. McGraw-Hill, New York, 1962. 310 pp. Illus. $8.50.

The Harvey Lectures, 1961–62. Jacques Monod *et al.* Academic Press, New York, 1962. 220 pp. Illus. $9.50.

History of the Primates. An introduction to the study of fossil man. Wilfrid LeGros Clark. British Museum (Natural History), London, ed. 8, 1962. 125 pp. Illus. Paper, 5s.

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Medical Genetics. Widukind Lenz. Translated from the German (*Medizinische Genetik: Eine Einführung in ihre Grundlagen und Probleme,* 1961) by Elisabeth F. Lanzl. Univ. of Chicago Press, Chicago, 1963. 232 pp. Illus. $6.50.

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Methods of Separation of Subcellular Structural Components. Biochemical Society symposium (University of Louvain), May 1962. J. K. Grant, Ed. Cambridge Univ. Press, New York, 1963. 162 pp. Illus. $6.50.

The Mountain Gorilla. Ecology and behavior. George B. Schaller. Univ. of Chicago Press, Chicago, 1963. 449 pp. Illus. $10.

Mucous Secretions. *Annals of the New York Academy of Sciences,* vol. 106, art. 2. Harold E. Whipple, Ed. The Academy, New York, 1963. 653 pp. Illus.

Nerve Cells and Insect Behavior. Kenneth D. Roeder. Harvard Univ. Press, Cambridge, Mass., 1963. 200 pp. Illus. $4.75.

Outlines of Biochemistry. Eric E. Conn and P. K. Stumpf. Wiley, New York, 1963. 399 pp. Illus. $8.75.

Procedures for Routine Laboratory Diagnosis of Virus and Rickettsial Diseases. S. S. Kalter. Burgess, Minneapolis, 1963. 108 pp. Illus. $5.

An Rh-Hr Syllabus. The types and their applications. Alexander S. Wiener and Irving B. Wexler. Grune and Stratton, New York, ed. 2, 1963. 124 pp. Illus. $4.50.

The Science of Biology. Paul B. Weisz. McGraw-Hill, New York, 1963. 798 pp. Illus. $8.50.

The Structure and Function of the Membranes and Surfaces of Cells. Biochemical Society symposium (London), March 1962. D. J. Bell and J. K. Grant, Eds. Cambridge Univ. Press, New York, 1963. 178 pp. Illus. $6.50.

Viewpoints in Biology. vol. 1. J. D. Carthy and C. L. Duddington, Eds. Butterworth, Washington, D.C., 1962. 300 pp. Illus. $14.95.

The Waking Brain. H. W. Magoun. Thomas, Springfield, Ill., ed. 2, 1963. 196 pp. Illus. $7.75.