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-