

occasions since 1929. The first three volumes were concerned with his experimental research and the resulting generalizations and theories, and the fourth contained papers of more general concern, such as review articles and public discussions in chemistry.

The selection of representative papers for the present volume was difficult, but it was decided, with Nesmeyanov's help, to exclude Vol. 4, and to distribute the contents of Vols. 1-3 under the headings: Part 1, "Organo-metallic Chemistry"; Part 2, "Elemento-organic Chemistry"; Part 3, "Organic Chemistry".

The meaning of "Elemento-organic Chemistry" may not be clear: Part 2 contains first a number of papers on 'onium' salts, particularly diaryl-chloronium, -bromonium, and -iodonium salts, and triaryl-oxonium salts. These are followed by a larger number of papers on the synthesis and reactions of alkyl titanates and other related titanium derivatives. Finally there are a few papers on the reaction of various silanes with olefines.

The whole volume contains about 180 papers, which, it should be emphasized, are printed in full with the complete experimental detail. Such a collection of papers, covering a very wide field, excellently translated and clearly printed, forms an impressive tribute to Prof. Nesmeyanov's work; furthermore, almost all organic chemists will find in this collection some papers having a direct bearing on their own work or chemical interests.

F. G. MANN

#### Modern Developments in Electron Microscopy

Edited by Benjamin M. Siegel. Pp. xiii + 432. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1964.) 96s. 6d.

ELECTRON microscopy is now so diversely applied to the two principal fields of metal physics and microbiology that the usefulness of a single volume devoted to both is limited; any one laboratory is likely to use only half this book. The techniques of specimen preparation are different in the two fields, and the vocabulary of interpretation so different as to make the biological results practically unintelligible to the physicist, and *vice versa*.

However, those articles which I am competent to judge (those dealing with metal physics) are particularly well written. Chapter 5, by Dr. Pashley, constitutes an up-to-date review of the application of electron microscopy and diffraction to the defect structure of crystals, and forms a good introduction to the subject for a research student. Siegel's opening chapter on the electron microscope seems to fall between the stools of elementary exposition and technical monograph; but still it will be useful to microscopists as a source of references, and as a background for the instruction manual accompanying their microscopes. The remainder of the book is good browsing value. It is interesting to see that the problem of obtaining a three-dimensional knowledge of structures by systematic sectioning is common to physics and biology. Fawcett's advice at the end of Chapter 6, to the effect that a sharp, beautiful image is likely to be a truer representation of Nature than one which is coarse and indistinct, also seems to be of universal validity.

In short, although one would not recommend that every electron microscopist should buy this book, one can recommend it as bedside reading: it is a good book to have available.

L. M. BROWN

#### Fundamental Particles

By K. Nishijima. (Lecture Notes and Supplements in Physics.) Pp. xi + 408. (New York and Amsterdam: W. A. Benjamin, Inc., 1963.) 11.85 dollars.

IT is difficult to conceive of an essentially better introduction to the theory of fundamental particles than Dr. Nishijima's *Fundamental Particles*. The first chapter is a historical survey of progress up to and including the discovery of pions. Chapter 2 presents, in clarity and

detail, the transformations of space and time inversion and charge conjugation; Chapter 3 deals with charge independence, iso-spin invariance and *G*-conjugation. Each transformation or principle is illustrated by its application to an important experiment, so that by the end of Chapter 3 the author has given the experimental basis of the established quantum numbers of the pion. Chapters 4 and 5 are concerned with the dynamics of the pion-nucleon interaction covering, *inter alia*, perturbation theory, *S*-matrix theory, fixed-angle dispersion relations, pion-nucleon scattering up to the first resonance, multi-pion resonances, and nucleon form factors; the author mentions, but does not enter, the field of partial wave dispersion relations. Not only is there a thorough explanation of principle, but also (as indeed throughout the book) there are sufficient examples to make it a useful guide in many practical calculations. Chapter 6 deals with strange particles (including resonances) establishing quantum numbers and some interaction properties, while the final chapter deals with the principal points in weak interactions, again with a wealth of applications.

As is necessary, Dr. Nishijima makes considerable use of the language of field theory, and thus a good knowledge of quantum electrodynamics is desirable for the fullest appreciation of the book. From the point of view of the beginner it is (perhaps) unfortunate that most works on quantum electrodynamics are more difficult than the present book and cover some of the same ground with less force and clarity. However, those who wish to use the book without knowledge of field theory will be able to do so.

To be a most excellent introduction to the subject is not the only function of *Fundamental Particles*; it should, for many years, be a valuable handbook to experimental and theoretical research workers in the field.

R. G. MOORHOUSE

#### Ancillary Mathematics

By Sir H. S. W. Massey and H. Kestelman. Second edition. Pp. xviii + 1053. (London: Sir Isaac Pitman and Sons, Ltd., 1964.) 65s. net.

THIS massive compendium, first issued in 1959 at 75s., was tailored to the mathematical requirements of those taking the London special honours degree in physics or chemistry. Its success has led to a second edition, at a reduced price, with an additional chapter on matrices. In 60 pages, there is a fairly comprehensive account of linear algebra and matrix theory, up to the Cayley-Hamilton theorem, eigenvectors, quadratic and Hermitian forms, unitary and orthogonal matrices, as well as nearly 100 good exercises for the student. Such a concentration is achieved partly by a terse exposition, demanding close attention, and partly by placing the chapter at the end of the book and so being able to make use of ideas on vectors and algebraic geometry from the earlier chapters. The science student may find the topic difficult, but he should be helped by his knowledge of its importance in theoretical physics to-day, and by the care the authors have taken to slant the account towards applications in this field.

T. A. A. BROADBENT

#### The Electronic Structure of Molecules

A New Approach. By J. W. Linnett. Pp. vii + 167. (London: Methuen and Co., Ltd.; New York: John Wiley and Sons, Inc., 1964.) 25s.

DR. LINNETT and his group have been working for some years now on a concept of valency which differs from that of G. N. Lewis, and in which pairing of electrons plays a subsidiary role to another concept, namely, the division of electrons into two sets of opposite spin. Although these views have been developed mathematically in the journals, this book makes no demands on the mathematical background of the reader. The views are presented qualitatively, reference being made