tation only for some spin-1 mesons. This objection is recognized and the Yang-Mills apparatus is removed in the last paper (Ne'eman), which should therefore also be read first. But a related idea of how a Lie algebra enters dynamics, now of current-density operators in Hilbert space and their commutation relations, is proposed to clarify the weak interaction. A parity-conserving weak current vector is drawn in 8-dimensional SU (3) space, and a similar parity-violating one in another SU (3) space; even SU (6) appears briefly on page 203. Prior knowledge of theoretical reduction of the weak interactions is useful here.

There is a minimum of debate on assignment of resonances, probably thanks to the Ω^-. The nuclear physics is 3 pages where Oakes tells us that the deuteron belongs to a $\overline{10}$.

The papers on genesis of symmetry breaking are sketchy reviews of dark calculations. Perhaps the clearest is "Octet Enhancement," formally nonleptonic weak, but with remarks on the electromagnetic and nonsymmetric strong interactions.

The book is not a mathematics book, and presumes extensive knowledge of the experimental situation; yet it is a bargain.

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Elihu Lubkin, formerly of Brown University, was recently appointed associate professor at the University of Wisconsin—Milwaukee.

Recapturing the excitement

THE FEYNMAN LECTURES ON PHYSICS. Vol. 3: Quantum Mechanics. By Richard P. Feynman, Robert B. Leighton, Matthew Sands. 21 chapters. Addison-Wesley, Reading, Mass. 1965. $6.75

by R. Bruce Lindsay

One of the most important duties of physicists is to insure their succession by the teaching of their discipline to the young. The most appropriate way of introducing the new student to the fundamental ideas of physics has been the subject of much experimentation over the years, and has resulted in the writing of countless textbooks pointing the way to salvation.

FEYNMAN

Most of this material has been prepared by those who have given primary attention to the teaching of physics and have not become too well known in fields of research. Their books, though often stamped to a certain extent with the personalities of the authors, have tended to be conventional in general character, and understandably so, since books to be widely used must be published and publishers have a natural desire to stay in business. But from time to time physicists with outstanding research reputations have become sufficiently excited over the problems of elementary physics teaching to try to concoct something really new and unconventional in its approach. A good example is provided by *The Feynman Lectures on Physics*, volume 3 of which is the book under review.

These volumes are based on lectures given during the past few years in the introductory course in physics for freshmen and sophomores at the California Institute of Technology. The first two volumes have dealt primarily with mechanics, and electricity and magnetism respectively. The third is devoted to quantum mechanics. Some may question the appropriateness of presenting a treatment of the most advanced of physical theories and to this degree of sophistication to sophomores, even at an institution of the level of the California Institute of Technology. It is certainly an unconventional procedure! Its justification presumably lies in the fact that quantum mechanics is the most powerful tool for understanding modern physical experience, and the future physicist should get hold of it as soon as he reasonably can.

How well has the author succeeded in his treatment? With great skill he guides the neophyte from an introductory description of what quantum phenomena are all about in terms of the wave-particle dualism on through the development of the concepts of state and probability amplitude with matrix analysis to the actual evaluation of the energy states of atomic systems. He uses a lot of words interspersed with clear diagrams of experiments, both mental and actual. He introduces frequent practical illustrations like the maser to sustain the students' interest. Throughout there is an air of breezy informality presumably designed to recapture the excitement of the lectures and the exuberance of the lecturer. To the mature physicist the development is indeed fascinating. Its impact on the elementary student is more questionable. Many will feel that the author is asking the student to think faster and more deeply than most are prepared to do at this stage of development. For most young people a grasp of fundamental physical ideas comes slowly, and though recipes can often be learned quickly, understanding of what they mean is a more gradual acquirement.

The reviewer has found some sections of particular interest, notably those on electron transmission through a crystal lattice and on the relation between the concept of symmetry and conservation laws. On the other hand he regrets that the author has seen fit to stress the probabilistic interpretation of quantum mechanics so emphatically as to give the impression that no change in this picture is ever possible. This gives the philosophy of the subject an unfortunate dogmatic twist, neither necessary nor desirable.

Without question this volume

should prove of enormous value as collateral reading for standard courses in quantum mechanics. Its status in elementary physics instruction is however open to question.

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A frequent contributor of book reviews, R. Bruce Lindsay is Hazard Professor of Physics at Brown University.

At low temperatures

ELECTRICAL RESISTANCE OF METALS. By George Terence Meaden. 218 pp. Plenum Press, New York, 1965. $11.50

by L. I. van Torne

The author states that this book was written to fulfill the needs of scientists and engineers who require a full and current presentation of the experimental facts together with a relatively concise account of the modern theory of the electrical resistance of metals and alloys. The author has achieved his goal, and students as well as scientists and engineers who need data or who measure electrical transport properties of metals should find this a valuable book.

In chapter 1 the author discusses the importance and utility of information concerning the electrical resistivity of metallic and semimetallic elements in the cryogenic temperature range. Chapter 2 is a comprehensive tabulation of electrical resistivity behavior of metallic elements at cryogenic temperatures. Chapter 3 gives a very brief outline of the theory of electrical resistivity in metals. A discussion of the Gruneisen-Bloch equation with regard to its limitations and utility for comparing resistivity data from different elements is given in chapter 4. Some remarks about the influence of alloying, plastic deformation, irradiation, high pressures, magnetic fields and specimen geometry on electrical resistivity are given in chapters 5 and 6. A review of electrical-resistivity measuring techniques at ambient temperatures and below and methods of achieving and controlling cryogenic temperatures are given in chapters 7 and 8. Rather complete author and subject indexes—often given in a cursory manner in books of this kind—allow the reader a rapid means of finding a specific reference or item of interest.

In summary, this book contains a wealth of experimental data on electrical resistivity of metals at low temperatures and presents several methods of obtaining such data. However, in the author's words, "no pretense is made that any part of the theory is exhaustively covered."

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The reviewer does electron microscopy and diffraction work in crystalline materials at the Martin Company, Orlando, Florida.

Fibrous and filamentary materials

CERAMIC AND GRAPHITE FIBERS AND WHISKERS: A SURVEY OF THE TECHNOLOGY. By L. R. McCreight, H. W. Rauch, W. H. Sutton. 395 pp. Academic Press, New York, 1965. $10.00

by R. P. I. Adler

Taken as a bibliography and a current survey of the state-of-the-art of whisker and fiber technology this book can serve as a practical starting point for materials scientists wishing to enter this field. The most valuable portions of the volume are a cross-indexed selection of 550 references, over 200 patents, and 58 organizations concerned with the theoretical and practical aspects of fibrous materials. The topics that are covered are: The Potential Strength of Materials (chapter 2); Applications of Fibers (chapter 3); Factors Affecting Fiber Strength (chapter 4); Reports on Organizations Conducting Fibrous Materials Studies (chapter 5); Evaluation and Discussion (Chapter 6); Conclusions and Recommendations (chapter 7); Patents on Ceramic and Graphite Fibers (chapter 8); Bibliography (chapter 9).

The first technical chapter presents a very brief comparison between the actual and theoretical strengths of selected filamentary materials. The obvious parameters of temperature and elastic moduli that influence the theoretical strength are pointed out while some relatively low strengths are attributed to fabrication and testing conditions. This is followed by