

departs from pure kinematics and presents the covariant formulation of the precession of a spinning particle. The existence of a polarization four-vector is first demonstrated, expressions for the various components are derived and interpreted, and the equation of motion is discussed. The existence of such a four-vector is by no means obvious, since the ordinary polarization (three-) vector is an axial vector whose relativistic generalization would be expected to be a skew four-tensor. In fact, a polarization four-vector can in general be defined unambiguously only for a group of spinless particles. The relation of this four-vector to the angular momentum four-tensor is utilized for the covariant separation of the intrinsic angular momentum of a group of spinless particles from their orbital angular momentum. The relation of this classical calculation to the corresponding quantum mechanical problem of a particle with spin angular momentum is touched on all too briefly. What a shame that a discussion of spinors could not have been included.

In spite of the relative compactness of the text, the exposition is extremely lucid throughout. Many of the questions that would be expected to occur to the reader are brought up and answered at once. However, let no one be deceived into believing that the material can be digested without effort. In this connection, the reader is advised to look up the very apt biblical verse referred to on p. 137 (St. James 1:22) and apply its admonition to the entire book.

Gesammelte Schriften and Vorträge. By Max von Laue. Vol. 1, 548 pp.; vol. 2, 513 pp.; vol. 3, 265 pp. Friedrich Vieweg & Sohn, Braunschweig, 1961. \$35.00 per set. Vol. 3 sold separately as *Aufsätze und Vorträge*, \$4.80. Reviewed by W. M. Elsasser, Princeton University.

The late Max von Laue (1879-1960) had himself planned this collection of his papers and lectures just before his death. If it is true that as the French say, "le style, c'est l'homme," this applies certainly to the famous physicist whose papers are reprinted here. Reproduction is by a photolithic method with the original page numbers deleted

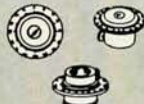


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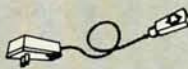
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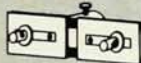
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and replaced by a continuous pagination; the job is so well done that it requires some effort to ascertain that apparently none of the text had to be re-set in type.

There are great men whose writing centers about autobiography and invariably reverts to it; there are others who deliberately set out and succeed in covering up their personal tracks for the sake of the objectivity of their work. Max von Laue belongs wholly to the second category. Such modest personal and biographical elements as there are will be found in Vol. 3, a miscellany of popular articles, public addresses, and obituary speeches on some of the great of science. This volume is preceded by a brief (30-page) autobiography. We begin to understand from it certain of the personality traits which made von Laue in his later life appear to many as something of a saint: by a unique combination of reticence of speech, personal tact, and completely unbending moral fortitude he, fervent patriot that he was, managed not only to survive the Nazis whom he clearly despised, but also to give help to innumerable of their victims. In advanced age, after the war, he made great personal sacrifices to be one of the leaders in restoring what was left of the once flourishing German scientific establishment.

We get occasional glimpses, in this volume, of his lifelong friendship with Einstein, which had nothing in it of the mere mutual accommodation of two celebrities but was clearly an intimate and very personal affair throughout. We learn from this book about the events that led up to von Laue's famous discovery: In February of 1912 he was visited one evening by a student of Sommerfeld's, P. P. Ewald (well known to all x-ray crystallographers, now living in retirement in the US). Ewald wanted help in his thesis work which dealt with propagation of light through crystal lattices, the latter concept still being somewhat hypothetical at the time. Von Laue was, among other things, a specialist in wave optics. The wavelength of x rays being roughly known from knife-edge diffraction experiments, the idea of obtaining x-ray diffraction patterns from crystals occurred to him on

the spot. This was bandied about among some younger experimentalists, and two of them volunteered to set up the experiment. It was in working shape several weeks later, and on the second photographic plate exposed there appeared unmistakable diffraction spots behind a single crystal of copper sulfate. It is strange to contemplate in the age of the large accelerators that only 50 years separate us from this golden age of scientific discovery.

Von Laue's commanding position as a theoretical physicist rests on his total work, not on any single idea, however successful. Vols. 1 and 2 contain 91 scientific papers spanning the period from 1904 to 1959. Whenever von Laue got engrossed in a subject, he ended up by writing a book or monograph. His *Special Relativity* was the first textbook to appear on this subject (1910); it is a classic, now in its 7th edition. Later followed a book on *General Relativity*, one on *X-ray Interference in Crystals*, one on *Matter-waves*, one on *Superconductivity*, and a little gem, the short *History of Physics*. Only the last two have been translated into English. Since all these works have been so successful as to be reissued, some in improved versions, a comprehensive and critical edition of von Laue's Collected Works seems dependent on the expiration of the copyrights on these books, which are omitted here and are of course indispensable for an appreciation of his total work. In the meantime, we believe that Vol. 3 will be indispensable to those who are interested in tracing the development of scientific thought in the early part of this century; they will also obtain some unique glimpses into the mind of a truly great man.

Atomic and Nuclear Physics. Theoretical Principles. By H. D. Bush. 218 pp. (Iliffe, London) Prentice-Hall, Englewood Cliffs, N. J., 1962. \$8.95.
Reviewed by H. H. Bolotin, Physics Department, Argonne National Laboratory, Argonne, Illinois.

The most striking characteristic of this volume is the ease with which the author leads the reader from one concept to another in an extremely natural and provocative way. Each topic is developed in a manner which em-

phasizes the physical concepts and the understanding of the importance of these concepts with respect to each other. Historical developments are used to great advantage and are accompanied by lucid accounts of their meaning and significance so that the better student will find himself brought to the point of anticipating the next significant step prior to its description.

The section on the nucleus, in which its constitution is described and treated, is done in a way that is outstanding for its clarity. The arguments for or against particular elementary constituents of the nucleus are developed and explained within the context of the experimental and theoretical developments of the era in which the topic was of paramount issue. Although this has been described by many previous authors, seldom has the development of this topic been as notable for its lucidity and for the basic understanding it gives to the student reader.

This is by no means a text devoted to the mere description and survey of physical concepts. It is best described as a detailed textbook which develops both the concepts and understanding of topics ranging from atomic structure to induced nuclear reactions, neutron physics (not technology), and electromagnetic radiation. This book is primarily designed to serve the needs of students who are experimentally oriented, since the contents are based upon a course, given by the author, for engineers entering the field of nuclear reactor technology. However, unlike several other texts geared to the same type audience, the success of this book is derived from its ability to give the reader a rather deep understanding of and insight into the fundamentals of the physics involved. This is definitely a textbook of physics and not an engineering treatise. In addition to the type of reader to whom the author addresses himself, this text is extremely well suited for an advanced undergraduate physics or chemistry student, or for an introductory graduate course in atomic and nuclear physics. In this regard, the only shortcoming of the book is the total absence of problems. If and when a second edition of this