

thorough discussion of angular momentum for both photons and electrons is particularly noteworthy; this aspect of quantum electrodynamics is only lightly touched by other texts. The work of Akhiezer and Berestetskii is a valuable graduate-level reference for physicists concerned with electron physics, and the serious students of atomic physics. It could also serve as an introduction to quantum field theory, although recent general texts provide broader and more readable introductions. Yet the book under review (to be distinguished from the full Russian text from which it was translated) deserves criticism on several counts.

Twelve years ago, the first Russian edition of *Kvantovaya Elektrodinamika* was published. The US Atomic Energy Commission subsequently published a complete translation (by Consultants Bureau, Inc.) as *Quantum Electrodynamics*, AEC-tr-2876. That paperbound edition is still available from the Office of Technical Services, Department of Commerce, Washington, D.C., for \$2.65. The Russian text was revised in 1959, and the book under review is a translation (by the Israel Program for Scientific Translation) of selected portions from this second edition. Recently, John Wiley & Sons-Interscience Publishers have announced their publication of the entire second edition.

The earlier English edition contains, among other topics, accounts of multipole radiation, the Breit formula, the Dirac equation for a Coulomb field, internal conversion of gamma rays, positronium, spectral line widths, bound states, and energy-level shifts. These practical applications comprise some 40 per cent of that edition. Regrettably, the present publisher chose to delete all such applications from the abridged edition under review, leaving simply the chapters on the free electron, the free photons, and the *S* matrix. Since many Western authors are unfamiliar with this exposition of these applications, the deletion was particularly unfortunate.

In contrast to the beautiful Pergamon Press editions of Landau and Lifshitz (at comparable prices), the text here is inexpensively typed, and

the Russian typography of the formulae lacks the clarity of Western typography. Furthermore, the book provides no index. While such an edition might be acceptable (although not desirable) for prompt and inexpensive publications of topical lectures, it is a shabby treatment for the second edition of a distinguished treatise.

Akhiezer and Berestetskii have written a useful book, and the second edition offers some valuable revisions of the earlier work. Nonetheless, the publication under review is no bargain. I shall be pleased to see the John Wiley & Sons-Interscience edition of this text.

Die Relativitätstheorie Einsteins. By Max Born. 328 pp. Springer Verlag, Berlin, 1964. Paper, DM 10.80.

Reviewed by Jacques E. Romain, Centre de Recherches Routieres, Brussels, Belgium.

This is the latest edition of a book which was first published in 1920. The author's purpose was to steer a middle course between oversimplified popular expositions and technical texts that are accessible only to readers with a thorough mathematical background. Clearly, this program is a challenge, and not everyone would be up to such a requirement. Professor Born surely is. That there are not many good books meeting these specifications is illustrated by the fact that a new revised edition of a forty-year-old book was thought in order by both an American and a German publisher.

If Professor Born were to write a new book on relativity today, he would probably not write exactly this one. However, the updating is effective and appears to be quite sufficient in view of the scope of the book. While using no more elaborate mathematical tools than elementary algebra, an occasional mention of differential equations (for Maxwell's equations) and a little bit of analytic geometry for the four-dimensional representation, the author manages to give a fairly detailed and quantitative account of the essential points of special relativity. Of course, as tensors are excluded the treatment of general relativity can be only qualitative.

The emphasis is on the purport and interpretation of the concepts, of the measurement procedures, and of the results. Simple easy-to-repeat experiments are described and comparisons are proposed in order to help the reader grasp particular points and to convince him of the merits of unexpected statements. The author takes pains to state the main criticisms that have been formulated against relativity (especially inconsistency claims, e.g., the "clock paradox") and to explain them away. A short chapter on cosmology affords an opportunity to disclose philosophical motivations in the backs of the minds of some supporters of several cosmological theories and provides a lesson in scientific objectivity.

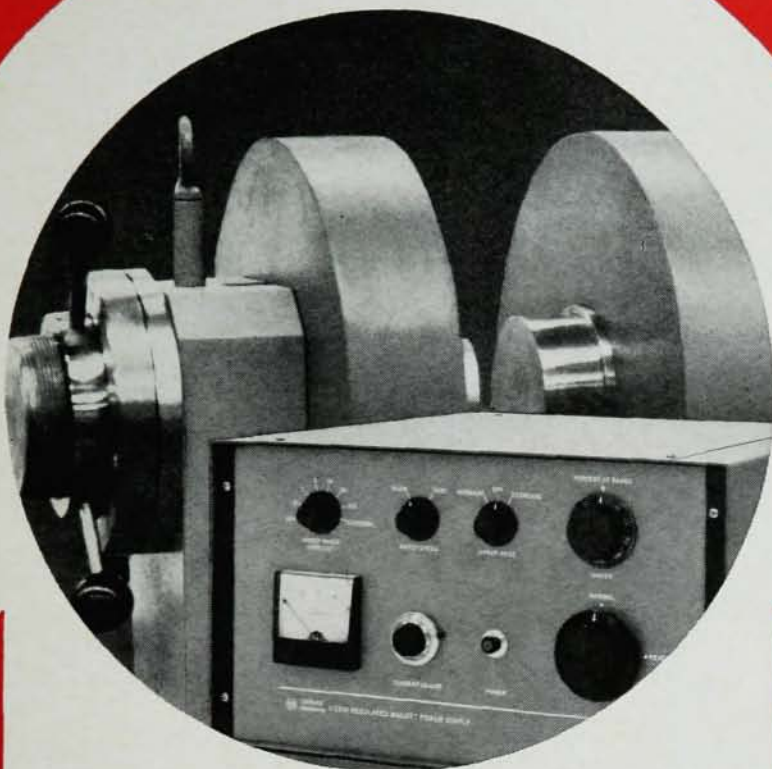
This edition is fully equivalent to the 1962 American edition. Therefore, as it is not cheaper than the latter, it will probably appeal to few English-speaking readers. However, it is worth mentioning that the language is clear and simple throughout, and provides easy reading to everyone with a practical reading knowledge of German.

Albert Einstein and the Cosmic World Order. By Cornelius Lanczos. 139 pp. Interscience, New York, 1965. \$3.95.

Reviewed by Herbert Malamud, Sperry Gyroscope Company, Division of Sperry Rand Corporation.

Lanczos' little book is probably best described by comparing it with another, for example, the recent revised edition of Max Born's *Einstein's Theory of Relativity* (Dover, 1962). Both are intended for the non-physical-scientist, both deal with special and general relativity, and both use only elementary mathematics, algebra, geometry, and arithmetic.

Born's book, however, presents far more of the physical consequences of relativity, describing the Doppler effect, interferometry, and so on, while Lanczos' book confines itself completely to the basic meanings of the theory in terms of our view of the universe, the Cosmic World Order, in his words. Lanczos describes elegantly and clearly the geometric basis of the relativity theories and its effect on Einstein's thought, the reason that it drove Einstein to such effort to



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find a unified field theory, and why he expected to find such a unified theory hidden in geometry. Einstein's lack of complete success in this undertaking may be blamed on the fact that he was biologically human; he simply did not live long enough. The next man of equal mental powers who devotes himself to the task, I am convinced, will probably succeed.

If I were a graduate student in physics, interested in relativity, I would certainly want to read Born. If I were a philosopher, a lawyer, or a historian with an interest in relativity, I would consider that Lanczos had written his book specifically for me. I have, in fact, never read a better nonmathematical exposition of relativity and its effect on the scientific model of the universe.

Lanczos combines his exposition of relativity throughout with a never-ending eulogy of Einstein. I do not object to this. Since my early teens, I have held Einstein as very little below the gods, and to find a man of Lanczos' stature agreeing with me gave me personally great satisfaction.

Elementary Particle Physics. By Gunnar Källén. 546 pp. Addison-Wesley, Reading, Mass., 1964. \$15.00.

Reviewed by Eugen Merzbacher, University of North Carolina.

Although there is no shortage of good books on the concepts and broad principles of the physics of elementary particles, few high-energy physicists have had the time, or the perspective, to provide us with a full textbook treatment of the theory as it is used in the analysis of experimental data. A book was available ten years ago when H. A. Bethe and F. de Hoffmann published Volume 2 of *Mesons and Fields*, but since that time we have had to rely on a flood of hastily published lecture notes. Such lecture notes can be extremely valuable, but one's pleasure in their appearance is enhanced when the product is as polished and coherent a textbook as this volume which is based on a course given by the author at the University of Lund in 1961-62. The use of consistent notation throughout seventeen chapters distinguishes Källén's *Elementary Particle Physics* from many other books with similar titles.

Strong interactions are given about twice as much space as weak interactions, but the discussion of both is thorough. The emphasis is on the calculation of cross sections, form factors, and branching ratios. The reader is taken in a businesslike fashion through the evaluation of every trace of Dirac matrices and every integration in phase space, but the conceptual features of elementary particle physics emerge only when he has accomplished some hard work with pencil and paper.

The most comprehensive discussion is reserved for the interaction of pions with nucleons and the weak interactions, although there is also a section on strong interactions of strange particles and associated resonances. Generally, the great virtue of Källén's book is that no topic is taken up unless the author can arrive at an angular distribution or a decay rate which may be compared with the experimental data available at the time of writing (early 1963, with a few more recent references, such as the Ω^- particle, added).

In spite of many deliberate omissions, this introduction to the theory of elementary particles can be recommended to everyone who wishes to study the theory from a primarily phenomenological point of view. There is, for instance, a full-dress derivation of the Rosenbluth formula for the cross section of electrons scattered by protons, a complete analysis of the spin and parity of the ω meson, and a detailed discussion of the consequences of the conserved vector current hypothesis.

The book is addressed primarily to graduate students in theoretical physics and presupposes a familiarity with quantum mechanics, including the Dirac equation and the elements of quantum field theory. Appendices on angular momentum, the Dirac equation, and second quantization are intended for a brief review. However, Chapter 5 goes considerably beyond the general level of the book and explores the theory of pion-nucleon scattering on the basis of the Low equation and the LSZ reduction technique in terms of forward dispersion relations, but Källén has made an effort to enable the less mathemati-