

est in psychology, in particular in C. G. Jung's archetypes, is well known. Here we find reprinted two papers which are otherwise not easily accessible: One deals with the influence of the archetypes on Kepler (I,1023); the other discusses certain aspects of the unconscious, (II,1212). Particularly interesting is Pauli's opinion on extra-sensory perception (II,1228,1298). It is also impressive to see how much harder it is to be clear, even for Pauli, if one is not writing about physics.

Finally, one must express one's gratitude to the two editors, R. Kronig and V. F. Weisskopf, for collecting and editing this magnificent work, and to the publishers for presenting it so well. May one wish, however, for a third volume? Pauli wrote many additional lecture notes, and semi-public letters which should receive wider circulation; (e.g., his lecture notes in Zurich on quantum theory, quantum field theory, statistical mechanics, and optics; notes from summer schools, as Les Houches; his widely circulated letter to Schwinger on quantum field theory, etc.). These are not even listed in the two volumes here. Perhaps one should collect them as well; even though they were not officially published, they bear Pauli's imprimatur.

Aufgaben und Lehrsätze aus der Analysis. By G. Pólya and G. Szegő. Vol. 1, 338 pp., DM 34; Vol. 2, 407 pp., DM 38. Springer-Verlag, Berlin and New York, 1964.

Reviewed by Dagmar Renate Henney, The George Washington University.

"Was ist unterrichten?

Zum eigenen Erfinden des Lernenden systematisch Gelegenheit geben."

(Nach Spencer)

This motto precedes the famous two volumes by Professors Pólya and Szegő and its philosophy is felt throughout the text. These books do not merely represent a collection of exercises and theorems, but the main emphasis is put on the order of the material. The authors desire most of all to activate the reader into being able to pursue mathematical analysis at his own pace and with increasing interest and capability. The great popularity of these two volumes shows

beyond doubt that they were successful.

The first printing of the *Aufgaben und Lehrsätze* appeared in 1925. The 1964 printing is the third and corrected version. It seems that there are few other books in mathematics—with the possible exception of Euclid's *Elements*—which have sold so many copies. The books have been translated into many languages. Dover Publishing Company came out with a photograph version in 1945. The books are quoted frequently and are well known to almost every mathematician as classical references in mathematical analysis.

There are many books in the mathematical literature—in French even more than in German—which comprise a collection of exercises, the above two volumes presenting possibly the most renowned. The books are primarily designed for independent study for the student as well as for the professor and the researcher. Much time has been spent by the authors collecting problems in a meaningful and effective way so as to guide the reader in his study of mathematical analysis. Transmitting knowledge is only of secondary importance to the authors. They are primarily interested in instilling within the reader a fruitful attitude towards mathematical thinking and to further the discipline of his scientific thoughts which they deem extremely important in the study of mathematics. According to the authors' point of view, it is of no use to memorize certain rules for the correct thinking process of solving a mathematical problem; rather one has to digest them carefully and then be able to use them almost instinctively. The same thoughts have been expressed by Pólya repeatedly, see for example his book entitled *How to Solve It*.

The collection of exercises includes those which have been published previously and those which have been passed on to the authors by word of mouth. Some of them are new results which have been changed into the form of an exercise and are now formally published for the first time.

The first volume contains three parts of fundamental character. The second contains six parts which are designed to cover more specialized questions and applications. Each volume contains ex-

ercises in the first half of the book and their solutions in the following half. At the beginning of each chapter in the collection of exercises the reader finds explanations which are helpful in recalling the needed definitions and theorems and provide the necessary motivation for his research. Frequently a hint is given to simplify a solution.

It would be presumptuous of the reviewer to praise the mathematical power of these books. These two volumes by Pólya and Szegő are not only a powerful and very effective mathematical treatise on analysis, but a work of art as well.

Atomic Migration in Crystals. By L. A. Girifalco. 162 pp. Blaisdell, New York, 1964. \$3.75.

Reviewed by Stuart A. Rice, University of Chicago.

This slim volume is intended to be an introduction to the theory of diffusion in solids, designed primarily for the intelligent layman. It is, in my opinion, a very clearly written monograph which provides a good survey emphasizing the important physical principles. I would have liked to have seen more emphasis on the role of dynamics, i.e., vibrational structure, to supplement the microscopic interpretation in terms of statistics, but this is a minor demurrer.

In general, I believe Professor Girifalco has achieved his goal and that the book will also be useful as supplemental material in freshman courses.

Elements of Quantum Electrodynamics. By A. I. Akhiezer and V. B. Berestetskii. Transl. by Israel Program for Scientific Translations. (2nd ed.) 301 pp. Oldbourne Press, London, 1964. Distr. by Daniel Davey, New York. \$13.50.

Reviewed by Bruce W. Shore, Harvard College Observatory.

The respected text by Akhiezer and Berestetskii deserves a wider use in this country. By restricting their exposition to the electromagnetic field, the authors are able to provide a detailed discussion of the quantum theory of electrons and photons. Electromagnetic interactions are treated in the framework of the *S* matrix, following the approach of Dyson. The text discusses in detail, if a bit tersely, renormalization and the removal of divergences from the *S* matrix. The



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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