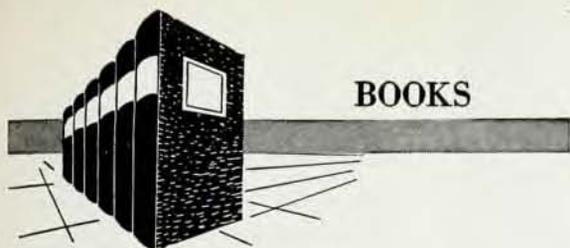


## BOOKS



THE LIMITS OF SCIENCE. By Leon Chwistek, with an Introduction and Appendix by Helen Charlotte Brodie. lvii + 347 pp. Harcourt, Brace and Company, New York, 1948. \$6.50.

The late Dr. Chwistek was for many years professor of the philosophy of mathematics at the University of Cracow and later at the University of Lwow, Poland. In his own country he was noted not only as a professional logician, but also as a literary critic and painter. He first acquired an international reputation for his emendations and proposed simplifications of Whitehead and Russell's classic work on the reduction of mathematics to logic. Eventually he attracted attention for his development of a science of signs along fresh lines, which he called "semantics," and for his contributions toward a "nominalistic" reconstruction of mathematics. Like Leibniz, Chwistek hoped to devise a system of symbolism with whose help the operations of rational thought could be fully mechanized and thereby prevented from making fanciful and meaningless flights into irrationality.

Chwistek wished to reconstruct mathematics in such a way that all statements of mathematics could be interpreted as being about concrete objects, and thus make unnecessary references to ideal or abstract entities. However, except for occasional papers, even his technical contributions to logic were not accessible to non-Polish readers; and his more general commentaries and analyses of questions in the philosophy of science remained almost completely unknown outside his own country.

The present work is a translation by Miss Brodie and Dr. Arthur Coleman of Chwistek's most complete exposition of his views both on the foundations of mathematics and on a large class of issues that arise in the logical analysis of physical science. Moreover, in addition to a helpful introduction by Miss Brodie, the present edition of the book contains much new and improved material supplied by Chwistek just before the outbreak of hostilities in 1939. Although the translation is not uniformly smooth and is occasionally even obscure, readers of English will be grateful for this opportunity to become better acquainted with Chwistek's major ideas.

The greater portion of this work is devoted to a technical reconstruction of mathematics on the basis of Chwistek's system of semantics, and it will doubtless be of primary interest to specialists in logic. However, the book contains much else, and even the technical discussions are set in the context of general reflections on fundamental problems in the philosophy of physical science. Chwistek was militantly dissatisfied with current attempts to use modern physics as a support for various irrationalistic or spiritualistic philosophies. He regarded the presence of metaphysical assumptions in any branch of positive science as a sign of the neglect of the criteria of sound reason; and he believed that by a systematic ap-

plication of his semantic method irrelevant and misleading interpretations of physical theory could be avoided. He thus took the central problem of logic to be the delimitation of the domain of exact thought, and the forging of a reliable technique for clarifying the confusions that arise from unreflective modes of conceiving things.

Accordingly, Chwistek has a number of suggestive and frequently illuminating things to say on basic questions concerning space, time, and relativity theory; on the issues of determinism, as these are raised by quantum physics; on the perennial problems of induction and probability; and on alternative conceptions and criteria of reality. For example, he regards the classical notion of determinism as meaningless, since it has no actual operative significance. Nevertheless, he rejects the widely fashionable current view that quantum mechanics implies some sort of radical indeterminism in nature, and maintains that the Heisenberg uncertainty relations are entirely compatible with a soundly conceived deterministic interpretation of physical processes.

By and large, Chwistek attempted to carry through in his analysis of positive science the nominalism he espoused in pure mathematics, and he exhibits considerable sympathy both for contemporary positivism and for dialectic materialism pruned of its metaphysical vagaries. He held that the concepts of physics are all only somewhat crude formalizations of material processes; but he insisted that though no such formalizations are ever complete or completely satisfactory, it is just irrational folly to abandon them wholesale in favor of some more intuitive understanding of the course of events. Perhaps the most pervasive feature of Chwistek's thought as it appears in this book is his rejection and distrust of all kinds of absolutes, and his wise insistence that even "exact thought" is not absolutely precise or complete. "Sound reason is only an island of safety," he remarks, "a refuge from an arbitrarily created fiction."

But while the book is undoubtedly stimulating, it falls short of being genuinely enlightening. Part of this failure should perhaps be credited to Chwistek's somewhat oriental style of writing, for he does not hesitate to mix what purports to be scientific argument with irrelevant and sometimes autobiographical asides. However, the faults of the book are more serious than this. Even the technical discussions of logic and mathematics suffer from fundamental unclarity—he does not observe (whether out of principle or otherwise is not clear) the elementary distinction between a sign and what it signifies (e.g., between the word "velocity" and the property of motion which the word represents), he appears to identify the meanings of terms with the images that are associated with them, some of his crucial arguments are presented with essential links missing, and in general his nominalistic reconstruction of mathematics is merely sketched rather than exhibited in workmanlike detail.

Again, in matters dealing with fundamental questions in the philosophy of science, he makes his disagreements more explicit than his own conceptions. For example, he rejects Poincaré's conventionalism on the foundations of

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applied geometry, but nowhere does he make evident just how his own view in this matter is different. And what is perhaps the most reprehensible feature of the book, Chwistek permits himself to decide on purely philosophical issues in terms of what he assumes to be the social consequences of a technical doctrine—a mode of disputation which is surely the rejection of “sound reason,” even though Chwistek’s own social views were decidedly humane and liberal.

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AN INTRODUCTION TO COLOR. By Ralph M. Evans. 340 pp. John Wiley & Sons, Inc., New York City, 1948. \$6.00.

Leonardo da Vinci was one of the last men to study color as a whole. Since his time the study of color has unfortunately undergone progressive dismemberment in the hands of physicists, chemists, biologists, artists, psychologists, geneticists, and a host of other specialists, with the result that the total picture has become almost inaccessible to a worker in any one of the fields. “An Introduction to Color” is a most successful attempt to recombine all of the scientific approaches into one orderly discussion. Not only does it cover the “properties of colored light, the properties of vision, and the action of the mind in interpreting color . . . and the interrelationships among these three aspects of color,” but it does so by precise, simplified, descriptive measures which will be respected by all readers.

While this book is an “introduction,” and the greatest pains have been taken to simplify the principles, no one will find it easy reading. The psychological concepts will be as difficult for most laboratory workers as the elementary mathematical concepts are to laymen. The interrelations of the aspects of color—physical, psychophysical, and psychological—are admittedly difficult and one of the book’s larger virtues is that it is bound to demand some new modes of thinking from any reader. It would have been helpful if the chapter titles had been carried through as page headings to assist in rereading and in keeping clear the excellent organization of topics.

Outside the scope of this text is a view of color which the reader must not expect to find covered—the field of affectivity in the broadest sense. The author has apparently set the limitation that everything discussed in this book must be measurable. Beyond these exacting boundaries lie the intangibles that make all this interest in color so vital. Beyond “color in photography,” “art,” and “design and abstraction” with which he closes the book, begins “color in living” and why we feel about it the way we do.

It is almost unnecessary to say that the work is painstaking, the text accurate, and the illustrations copious and admirable. Three hundred line drawings reinforce every point that can be graphically illustrated, and the fifteen color-process plates are nearly as effective as were the original photographs in demonstrating psychological effects. Would that all textbooks could be made so clear and attractive!

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UNDERWATER EXPLOSIONS. By Robert H. Cole. 437 pp. Princeton University Press, Princeton, New Jersey, 1948. \$7.50.

An excellent treatment of the subject from the physicist’s point of view. Devoted largely to the specialized kind of dynamics associated with the detonation of high explosives under water and with the various forms in which the resulting energy is dissipated. With the possible exception of the discussions of instrumentation, the ordnance engineer and naval architect will find little to aid them in their continual weapon-vessel conflict except a better understanding of the fundamental ideas involved. For the naval physicist, however, it remedies a serious deficiency in the literature.

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### Books Received

PRINCIPLES AND METHODS OF TELEMETERING. By Perry A. Borden and Gustave M. Thynell. 230 pp. Reinhold Publishing Corporation, New York City, 1948. \$4.50.

LES ACTIONS À DISTANCE. By R. d’Aubry de Puymorin. 78 pp. Gauthier-Villars, Paris, 1948.

PRINCIPLES OF SERVOMECHANISMS. By Gordon S. Brown and Donald P. Campbell. 400 pp. John Wiley & Sons, Inc., New York City, 1948. \$5.00.

MOLYBDENUM. By R. S. Archer, J. Z. Briggs, and C. M. Loeb, Jr. 391 pp. Climax Molybdenum Company, New York City, 1948.

COLLEGE PHYSICS. Third edition. By Henry A. Perkins. 786 pp. Prentice-Hall, Inc., New York City, 1948. \$6.65.

DISTILLATION AND RECTIFICATION. By Emil Kirschbaum. 426 pp. Chemical Publishing Co., Inc., New York City, 1948. \$10.00.

ELEMENTS OF PHYSICS. Fifth edition. By Alpheus W. Smith. 745 pp. McGraw-Hill Book Company, Inc., New York City, 1948. \$4.50.

INTRODUCTION TO PHYSICS. Second edition. By Harley Howe. 599 pp. McGraw-Hill Book Company, Inc., New York City, 1948. \$4.50.

ESSENTIALS OF PHYSICS. By Carl F. Eyring. 422 pp. Prentice-Hall, Inc., New York City, 1948. \$5.00.

AN INTRODUCTORY COURSE IN COLLEGE PHYSICS. Third edition. By Newton Henry Black. 800 pp. The Macmillan Company, New York City, 1948. \$5.00.

THE GENERAL PROPERTIES OF MATTER. Fourth edition. By F. H. Newman and V. H. L. Searle. 431 pp. Longmans, Green & Co., Inc., New York City, 1948. \$5.25.

MIT RADIATION LABORATORY SERIES. Louis Ridenour, Editor-in-Chief. McGraw-Hill Book Company, Inc., New York City, 1948. Vol. 22, Cathode Ray Tube Displays, edited by Theodore Soller, Merle A. Starr, and George E. Valley, Jr., 746 pp., \$10.00. Vol. 26, Radar Scanners and Radomes, edited by W. M. Cady, M. B. Karelitz, and L. A. Turner, 491 pp., \$7.00.

SCIENTIFIC RUSSIAN READER. Edited by Noah D. Gershevsky. 253 pp. Pitman Publishing Corporation, New York City, 1948. \$3.50.

A TEXTBOOK OF HEAT. By LeRoy D. Weld. 436 pp. The Macmillan Company, New York City, 1948. \$5.00.

TECHNICAL OPTICS, Volume I. By L. C. Martin. 343 pp. Pitman Publishing Corporation, New York City, 1948. \$7.50.

THE KELLEY STATISTICAL TABLES. Revised Edition. By Truman Lee Kelley. 223 pp. Harvard University Press, Cambridge, Massachusetts, 1948. \$5.00.