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ON THE PROBLEM OF APPLIED MATHEMATICS

By Dr. JAMES H. TAYLOR

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ALMOST anything is tremendously complicated. Frazier set out to write a monograph on a certain cult of ancient Greece and ended up with his famous work of twelve volumes entitled "The Golden Bough." Consider a simple hobby like stamp collecting. One is soon involved in a maze of pertinent details such as kinds of paper, methods of printing, types of perforations, colors and shades which even the Bureau of Standards might find difficult or impossible to determine, and finally watermarks, overprints, surcharges and forgeries.

In comparison with any other well-recognized body of knowledge, mathematics must be relatively simple. Consider for instance a given mathematics, that is, a branch of mathematics like Euclidean geometry or projective geometry or real variable. You perhaps know how any one of these subjects may be set up. After two thousand years of experience the "natural" way appears to be as follows. One lists a set of undefined elements and relations, and a set of unproved propositions involving them; and from these all other propositions or *theorems* are to be obtained by the methods of formal, deductive logic. The unproved propositions which are imposed are called axioms, postulates or assumptions. For example, in projective or in Euclidean geometry "point" and "line" are undefined elements; the relation "on" is an undefined relation. One of the axioms reads as follows: If A and B are distinct points there is at least one line on both A and B.

It is important to appreciate that a mathematics seems to be completely determined once the postu-

More serious criticism may be made in regard to Brachet's acceptance of the demonstration of a chemotactic response of sperm to egg water on the basis of capillary tube experiments. Jennings, Morgan and others had long ago pointed out the inadequacy of that method and had emphasized the pitfall of trap-action. Chapter VI is a departure from this sequential presentation of developmental phenomena and consists in a discussion of the nucleic acids, a subject to which Brachet has made many outstanding contributions. Growth, differentiation and metabolism, from the viewpoint of the energetics of these processes, comprise the subject-matter of Chapter VII. In Chapters VIII and IX metabolic experiments and measurements on developing eggs of invertebrates and of batrachians respectively are discussed. In Chapter X the extensive and highly controversial work on the metabolism of the "organizer" and on the chemical nature of the inductive substance is presented with admirable objectivity considering the fact that some of the author's own work is involved. An excellent and apparently successful attempt is made to reconcile the differences in results obtained by various workers in this technically difficult field. Chapter XI contains a brief treatment of the recent work on regeneration. Chapter XII is an attempt to draw some general conclusions and present potentially fertile lines of research.

Although Brachet did not have access to publications in the Allied countries after the occupation of Belgium, this lack is not particularly noticeable, and the book is on the whole quite up-to-date. It is exceptionally free of factual errors and is well indexed.

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RADIO

Principles of Radio. By KEITH HENNEY. 5th edition. New York: John Wiley and Sons, Inc. 1945.

FOLLOWING a brief survey of the latest edition of "Principles of Radio," the reviewer recalled years now long past when he read avidly books like Stuart Ballantine's "Radio Telephony for Amateurs" (1922) and Elmer Bucher's "The Wireless Experimenters' Manual" (1920). Mr. Henney's first edition, published in 1929, was a notable addition to this class of useful books.

There is an emphatic trend toward the presentation in engineering curricula of larger and larger amounts of mathematical physics; this trend has proceeded with increasing acceleration during the past fifteen years. In the fields of radio and electronics there has been a parallel development: many young men who did not undertake the study of electrical engineering nevertheless proceeded to work in these fields; and therefore sought information which would enable them successfully to solve the problems which they faced. It is to such men that Mr. Henney has directed his book. How successful he has been is best demonstrated by the fact that five editions of the book have been launched in a period of sixteen years. In recent years his book had been useful not only to radio amateurs and to radio servicemen, but also to those who want to learn something about radio after working many years in some other field.

It is always difficult for an author to produce a useful book which is at once elementary and rigorous. Mr. Henney has achieved a nice balance; quite rightly when rigor demands a very complicated explanation, he chooses a simple explanation that best helps his reader. Thus the book is very compact. In his first chapter—entitled "Fundamentals"—he reviews atomic theory and the electrical components of the atom, units of measurement of electric current and charge, the expression of large and small numbers as powers of ten, the plotting of curves and electrical symbols. He then proceeds with a well-illustrated discussion of direct-current circuits, magnetic fields and alternating-current circuits. In Chapter 11, he begins his description of vacuum tubes and the circuits in which they are used. This leads naturally into an analysis of radio transmitters and receivers. The last part of the book is devoted to material—new in this edition—on frequency modulation and ultra-high-frequency phenomena.

The most important characteristic of this book is the choice of problems and the choice of the method for presenting them. It is clear that Mr. Henney either has faced these problems in the same manner as his reader or that he knows precisely what it is that most confuses the neophyte in radio. Step by step he answers the questions in the order in which they are likely to arise in the minds of the amateur or serviceman. This is, of course, the key to the success of the several editions. It is to be hoped that Mr. Henney will continue in later years to bring his book up to date in the manner which he has so successfully followed during the last fifteen years.

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BOOKS RECEIVED

BOYER, LEE EMERSON. *An Introduction to Mathematics for Teachers.* Illustrated. Pp. xvii + 478. Henry Holt and Company, Inc. $3.25. 1945.

LIDDELL, DONALD M. *Handbook of Nonferrous Metallurgy.* Second edition. Illustrated. Pp. xi + 655. The McGraw-Hill Book Company. $6.50. 1945.

Procedure Handbook of Arc Welding Design and Practice. Eighth edition. Illustrated. Pp. xii + 1282. The Lincoln Electric Company. $1.50. 1945.