Book Reviews

Mathematics

Lectures on Modern Mathematics. vol. 1. T. L. Saaty, Ed. Wiley, New York, 1963 x + 175 pp. Illus. $5.75.

The preface states that the six expository lectures published in this volume are the first in a series of 18 lectures being given at George Washington University, jointly sponsored by the university and the Office of Naval Research. Two subsequent volumes will contain the remaining lectures. The idea behind the series is to describe a substantial research area of mathematics, broadly and comprehensively, for an audience of mathematicians not specialists in that area.

The first lecture, "A glimpse into Hilbert space" by P. R. Halmos, covers seven topics including commutators, shifts, and Toeplitz operators. Halmos lists ten unsolved (at that time) problems, and it is worthy of note that, as of 2 May 1963, three of the problems had been solved.

In "Some applications of the theory of distributions," Laurent Schwartz summarizes the main elementary results of the theory and then discusses applications to partial differential equations with constant coefficients and to inhomogeneous equations. There is also discussion of division of distributions.

A. S. Householder's "Numerical analysis" gives a comprehensive survey of the problems of that subject, which are classified by the author as "dirty" problems (that is, given a method which would be effective for computing a certain quantity if strict arithmetic operations were possible, how effective is that method when account is taken of the fact that the operations actually available are only pseudoarithmetic?) and "clean" problems (that is, those of constructing and undertaking methods that are at least theoretically effective). An example of a "dirty" problem is error analysis, and of a "clean" problem, matrix inversion and reduction.

The first paragraph of the lecture "Algebraic topology," by Samuel Eilenberg, contains the following sentence: "Progress in algebraic topology is usually not achieved by going forward and applying the already existing tools to new problems, but by constantly going back and forging new more refined tools which are necessary to achieve further results." Eilenberg illustrates his point with the problem of the existence of a continuous tangent vector field on the n-sphere in Euclidean $(n + 1)$-dimensional space. He convincingly shows that "the solution involves everything we know in algebraic topology." [The first result was due to L. E. J. Brouwer (in 1908) and the final solution to Frank Adams (in 1962).] The rest of the lecture deals with applications of algebraic topology to other branches of mathematics.

In his lecture, "Lie algebras," Irving Kaplansky discusses, among other topics, the connections with groups, the classification of simple algebras, and Lie algebras of characteristic p.

The final lecture of this volume is "Representations of finite groups" by Richard Brauer. Brauer begins by reminding his audience that a "tremendous effort has been made by mathematicians for more than a century to clear up the chaos in group theory. Still, we cannot answer some of the simplest questions." Brauer gives that as his reason for being fascinated by the subject, and he communicates something of this feeling to his audience. He makes an exhaustive survey of the theory of representations of finite groups, including no fewer than 40 unsolved problems. There is also a section in which the author's aim is "to demonstrate that characters form a powerful tool for the study of finite groups."

It is difficult to judge the success of the actual lectures by reading the essay. However, since each author is a top-ranking specialist speaking to the nonspecialist, one must accept what each regards as challenging and important, although another specialist in the field might be more critical. In the preface, the editor remarks that the series should be useful and encouraging to the graduate student in mathematics who is embarking on his research career. This may very well be so, but nearly all the lectures are somewhat formidable and one appears quite dull. On the other hand, several are fascinating and challenging. Which is which should be decided by the reader himself.

R. D. James
*Department of Mathematics,
University of British Columbia*

Nuclear Engineering

Introductory Nuclear Reactor Theory. Herbert S. Isbin. Reinhold, New York; Chapman and Hall, London, 1963. xvi + 624 pp. Illus. $22.50.

The present stage of development of nuclear engineering makes the writing of a textbook on nuclear reactor theory a difficult task. It is necessary to give the student a physical feel for the behavior of a chain reacting assembly while introducing him to some of the problems and methods of reactor design. As a result of the changing nature of the field, there is considerable disagreement among reactor designers and teachers with respect to the content, emphasis, and desirable level of a textbook on reactor theory. In view of the difficulties, Isbin has made a reasonable, consistent, and useful selection of material for a first-year graduate course. He emphasizes the basic aspects of the theory but also touches on some of the more advanced theoretical treatments. The latter are supplemented by many references to the recent literature. Newer practical developments are covered in examples and in a large number of excellent problems which broaden the treatment beyond what is possible in the classroom.

The author begins with a general introductory chapter on nuclear reactors; this is followed by a brief review of nuclear reactions, and then by chapters on neutron moderation, neutron diffusion, steady-state aspects of nonmultiplying media, the bare, critical, homogeneous reactor, the reactor with a reflector, characteristic dimensions and theory, reactor dynamics, transport theory, a generalized treatment of the