

cules. Experimental and theoretical results covering absolute and relative intensities and line widths are discussed in some detail for a few representative molecules and references are given for others. The skeleton of concepts and the meat of individual data make up roughly the first half of the book. In the second half they are combined into a body which is then put to work on a variety of practical problems. A large amount of space is devoted to the theory of infrared emissivities, where the population of molecular levels is in thermal equilibrium. Since radiation is usually not in thermal equilibrium with matter this lack will in general also upset the thermal equilibrium of matter and this leads to a description involving several "temperatures" which is presented in two chapters on flames. Two final chapters deal with practical problems concerning solid and liquid propellants.

In approaching radiative transfer problems the author attempts to formulate a method which is based on hemispherical emissivities. These are directional averages which do not lend themselves very well to the formulation of an equation of transfer and in the attempt to overcome this deficiency the mathematics gets somewhat tangled up. There are mysterious factors $\cos \theta$ which appear from nowhere. I have a feeling that there are some good ideas buried in this chapter but until someone cleans up the mathematics I shall continue to use the more standard methods as discussed for example in the writings of Chandrasekhar.

In the preface the author states that "in the selection of subject matter he has been strongly biased by the original researches performed by his own group. Nevertheless an effort has been made to prepare a coherent study." The extensive bibliography at the end of each chapter should prove very valuable in this respect. In addition to its use for the research scientists this book also is aimed at students in applied science and each chapter contains a number of problems. It appears to the reviewer that some of the so-called hints going with these problems are not very useful. One such hint, for example, refers to a technical report issued at the California Institute of Technology, and a student in a foreign country might have a hard time locating this reference.

This book definitely fills a gap which has been painfully apparent for some time. It should prove very valuable to research workers confronted with high-temperature problems which involve radiation.

Fluid Dynamics. By D. E. Rutherford. 226 pp. (Oliver & Boyd, England) Interscience Publishers, Inc., New York, 1959. \$1.95. Reviewed by J. Gillis, *The Weizmann Institute of Science*.

THE University Mathematical Texts series has by now an established place in the mathematical education of undergraduates at British universities, but its usefulness extends over a very much wider field. This latest addition to the series is particularly welcome. It presents basic hydrodynamics in a refreshing way,

combining mathematical rigor and exactitude with physical insight.

The book begins with the standard material on non-viscous incompressible flow. The welcome surprise follows in the form of a long chapter, indeed the longest in the book, on compressible flow. This includes linearized theory, a substantial discussion of shock waves, the Prandtl-Meyer expansion, the hodograph transformation, and many ancillary topics. The student familiar with the chapter may still be far from expert on compressible flow, but he will have many of the basic notions and will have a good idea of where and how to pursue the subject. The last chapter is devoted to a short and mainly qualitative account of boundary layer theory.

The Theory of Optimum Noise Immunity. By Vladimir A. Kotelnikov. Translated from the Russian by R. A. Silverman. 140 pp. McGraw-Hill Book Co., Inc., New York, 1959. \$7.50. Reviewed by George L. Turin, *Hughes Research Laboratories*.

THE American engineer is apt to be rather lacking in his knowledge of other languages and of foreign technical literature—especially so, sadly, if the language and the literature happen to be Russian. To this, and to the only recently diminishing unavailability here of Russian technical works, must be attributed the almost complete overlooking in this country of Kotelnikov's important work on optimum communication systems. Originally a 1947 doctoral dissertation, and subsequently published (with minor modifications) in the USSR as a book, *The Theory of Optimum Noise Immunity* is now generally available in an excellent English translation. Only a brief scanning of the volume will convince the statistical communication theorist and the communication system engineer of the unfortunateness of the thirteen-year delay, for they will find that the author anticipated by several years much of the fundamental English-language literature in the field.

The book covers areas of what we should call the application to communication systems of hypothesis-testing and estimation theories, where the term "optimum noise immunity" refers to the minimization of an error criterion (probability of error, mean-square error). After a brief introductory section which presents the necessary mathematical tools, the remainder of the volume is devoted successively to the problems of digital communication, continuous-parameter transmission (e.g., telemetry), and waveform transmission and restoration. Those versed in modern communication theory will recognize many now-familiar concepts: the a-posteriori-probability computing receiver, minimum-variance parameter- and waveform-estimating receivers, geometrical (signal-space) models of communication systems, the sampling theorem, the noise-threshold effect, etc. Detailed general analyses of the performance capabilities of optimum communication systems are also presented, and the author, no pure theoretician,

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The only major feature of the book this reviewer finds to criticize is its price. The volume contains only 140 pages, photographically reproduced from type-written copy rather than typeset. Yet the retail price is, surprisingly, \$7.50. Perhaps the high price was set in the fear of a small market; we may only hope that it does not guarantee one.

Better late and expensive than never, however. We may welcome to our bookshelves a book which in 1947 would have been almost revolutionary in its impact on our viewpoint, and which even now will serve us as an outstanding and not entirely familiar reference work.

Progress in Dielectrics, Volume 1. Edited by J. B. Birks and J. H. Schulman. 312 pp. John Wiley & Sons, Inc., New York, 1959. \$11.00. *Reviewed by Stuart A. Rice, Institute for the Study of Metals, The University of Chicago.*

THIS volume contains an uneasy mixture of basic science and engineering. The review article by Franklin on the ferroelectricity of barium titanate single crystals is an excellent survey of the phenomenological theory and experiments. This reviewer would have appreciated some treatment of the extant molecular theories, but this comment should not be taken to detract from the utility of the review. As an example of the engineering articles, there is a review by Liao and Plump on gaseous dielectrics containing sections dealing with rotating machinery, transformers, etc. In all, seven reviews appear in this volume. Aside from the two articles cited, there are papers dealing with dielectric breakdown in solid insulation (Mason), dielectric breakdown effects in crystals (Davisson), electric strength and high field conductivity of dielectric liquids (Lewis), nonoxide ceramic dielectrics (Popper), and electrophoretic deposition of insulating materials (Birks). Although there is interesting information in several of the papers, I do not believe the volume will find much use by physicists or chemists.

Gmelins Handbuch der anorganischen Chemie (8th Revised Ed.). *Fluorine*: Suppl. to Syst. No. 5; 258 pp.; \$36.00. *Silicon*, Part C. Syst. No. 15; 501 pp.; \$67.44. Verlag Chemie, GmbH, Weinheim, Germany, 1959 and 1958. *Reviewed by H. A. Liebhafsky, General Electric Research Laboratory.*

PHYSICISTS unacquainted with *Gmelin* can form an impression of this important handbook by scanning the review of the supplementary volume on germanium (*Physics Today*, July 1959, p. 36). As the present volumes show, the virtues of the work continue unabated. The German-English index continues