

rather interesting consequence of distribution theory is not only that many of the fallacious (!) methods long used by applied mathematicians are found to be correct, but also that they could in some cases have gone much farther if they had only dared.

This new book on the subject begins with a concise but very lucid account of basic Fourier integral theory, followed by a definition of distributions and their fundamental properties. The second part of the book deals with some applications of these ideas to physical problems. There are chapters on diffraction and circuit theory followed by a long chapter on the use of Fourier transforms for solving partial differential equations. The third part is devoted to linear filters, approximation theory, stochastic functions, and related problems. And the book ends with a useful chapter on the numerical calculation of Fourier transforms.

It is a welcome addition to the regrettably inadequate literature on the subject. The reader will at times be disappointed that many of the applications are well known examples of Fourier transforms such as one can find in any classical text, in fact, such as one could handle very well without using distributions at all. However, they do make clear the meaning of distributions and demonstrate the saving in expression, and consequently in concepts, which one can obtain by using them. A striking example of this occurs, in fact, in the pure mathematical introductory section, viz. the elegant proof of the Poisson summation formula.

There are a number of minor typographical errors.

Information Theory, Statistical Decision Functions, Random Processes. Conf. Proc. (Prague, June 1959). Jaroslav Kožešník, ed. 843 pp. (Publishing House of the Czechoslovak Academy of Sciences, Prague) Academic Press, Inc., New York, 1960. \$22.00. Reviewed by George L. Turin, University of California, Berkeley.

TO review in detail a book of 843 pages, containing 48 papers on a variety of subjects and in four languages, and to do this within the space of a few hundred words, is a task that would discourage the most stalwart of reviewers. The present reviewer, not even a bit stalwart, will content himself with giving a few statistical data and general comments on the contents and tone of the volume.

The book is a reprint of the original Transactions of the Second Prague Conference on Information Theory, Statistical Decision Functions and Random Processes, held on June 1-6, 1959. (The First Prague Conference met during November 28-30, 1956; the Third will take place during June 4-16, 1962.) The papers in it may be classified in many ways: for example, by language (English-30, French-7, Russian-6, German-5), country of origin (Czechoslovakia-22, Poland-6, Germany-4, Russia-4, USA-4, Hungary-3, Rumania-2, France-1, Lithuania-1, Sweden-1), or length (ranging from 2 to 148 pages). More importantly, one may make a (somewhat arbitrary)

classification by subject matter, using categories suggested by the title: Probability Theory and Random Processes-25, Information Theory (in the sense of Shannon)-12, Decision Theory-11.

This last category requires a word of explanation. In the United States, the term information theory (or, sometimes, statistical communication theory) is often used more broadly than the extent implied in the second category; in this broader sense, it comprises topics in all three categories, but looked at from the viewpoint of the communication engineer. It is therefore important to point out that most of this volume will not be of immediate interest to the engineer, versed though he may be in statistical communication theory. Most of the papers are written by and for probability theorists and statisticians who may have a marginal interest in communication theory: The tone is generally that of the *Annals of Mathematical Statistics*, not of the *IRE Transactions on Information Theory*. A final classification (made by trying to imagine in which of the two above-cited journals each paper might have appeared at the present time) will emphasize the point: papers primarily of interest to probability theorists-36 (710 pp.), papers primarily of interest to engineers-12 (124 pp.). In the first of these groups appear such papers as "On Random Solutions of Integral Equations in Banach Spaces". In the second one finds, for example, "Filters and Predictors Which Adapt Their Values to the Unknown Parameters of the Input Process".

For further details on the volume, the reader is referred to *IRE Trans. on Inform. Thy.*, IT-7, 201-204 (July 1961), wherein a list of titles and some abstracts are given. In general, the quality of the papers is high, and the Institute of Information Theory and Automation of the Czechoslovak Academy of Sciences may feel itself amply rewarded for its efforts in organizing this series of symposia.

Waves in Layered Media. By Leonid M. Brekhovskikh. Transl. from Russian by David Lieberman. Transl. edited by Robert T. Beyer. Vol. 6 of Applied Mathematics and Mechanics, editor-in-chief F. N. Frenkiel. 561 pp. Academic Press Inc., New York, 1960. \$16.00. Reviewed by Nicholas Chako, Queens College.

IT is only in the last few years that Russian scientific monographs have been translated into English or German, whereas the reverse process has been going on for at least a quarter of a century. Most of the Russian books that have been translated are on an advanced level and, in many cases, the English or German translations are revised editions or offer improvements on the original texts. Many contain original researches unduplicated elsewhere. Consequently, the translations constitute an important contribution to the large community of scientists not familiar with Russian.

Professor Brekhovskikh's book belongs to these distinguished translations. It contains largely his own in-



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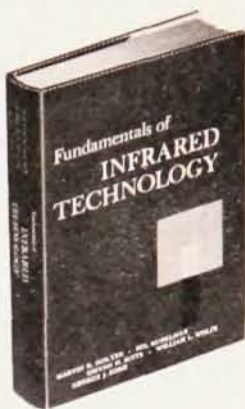


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vestigations in this field, as well as those of his countrymen. However, the author has not ignored the important contributions made outside his country. To this reviewer's knowledge, Professor Brekhovskikh's book has no competitor in its field, in both subject matter and comprehensiveness.

As the title indicates, the book is a study of the reflection and refraction (transmission) of waves in media composed of layers separated by planes or other regular geometrical surfaces of different materials, such as liquid-air, solid-air, and liquid-solid layers, etc., with absorbing and nonabsorbing properties. Because of their mathematical similarity, acoustic (elastic) and electromagnetic waves are treated side by side. The first three chapters are limited to plane-wave propagation and pulses. The author analyzes thoroughly the reflected and refracted fields under general conditions of incidence and considers critical values which give rise to propagation along interfaces, to complete transmission, and to complete reflection. (A detailed discussion of waves of limited extent is included.) He also covers the application of the theory and the interpretation of experimental results.

The last three chapters are devoted primarily to reflection, refraction, and propagation of spherical waves due to point sources and pulses, from plane and spherical boundaries separating homogeneous and inhomogeneous media, such as ground-air, air-water, and solid layers (seismic waves). The author has given one of the best and clearest expositions of the electric and magnetic dipole problem over both the plane and curved earth. Of special interest is his analysis and discussion of surface waves and of the cases where the receiver is embedded in an absorbing medium and where the source and the receiver are both located in the layer medium. The analysis is carried out on the basis of wave theory and by geometrical-optics approximation to the exact theory. The limitation of the latter theory to the solution of the problems of calculating the reflection and transmission coefficients and fields is demonstrated. The normal mode analysis is applied to the problems of propagation in a solid layer, in a liquid layer with a free surface (ocean), in a layer bounded by inhomogeneous media, and others. The important problem of the formation of caustics after reflection from an inhomogeneous half space and the behavior of the field in the neighborhood of a caustic are discussed in detail.

In the last sections of the book, the author gives a clear exposition of the methods used to calculate the fields for sonar wave propagation (underwater channel) and long-distance radio propagation, and the conditions of shadow-zone formation. Finally, a long list of references to original papers and books, of which more than a third are of Russian origin, is included in the last pages of the text. In spite of its length and diversity of material, the reviewer has found few errors and misprints, which the reader can easily correct.

The reviewer has derived great pleasure and profit

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in reading the text and recommends it highly, not only to the specialist in the field, but also to every scientist interested in acquiring a modern point of view on problems of wave propagation in inhomogeneous media. As a text it can be successfully used in a (year) course for students in physics, applied mathematics, or engineering. On the other hand, the first three chapters together with some selection from the other chapters would make excellent material for an advanced undergraduate course in physics or engineering.

Electronic, Radio, and Microwave Physics. By D. E. Clark and H. J. Mead. 521 pp. The Macmillan Co., New York, 1961. \$25.00. *Reviewed by Sanborn C. Brown, Massachusetts Institute of Technology.*

This book should serve as a useful reference for students in the field of electronics or microwave physics. It is written for physicists from the point of view of physicists and is based on fundamental physical laws and relationships rather than engineering techniques. The first four chapters do well in introducing the necessary mathematical background and the principles of electromagnetic theory, transmission lines, and waveguides. Much space is devoted to such topics as nuclear magnetic resonance, electron magnetic resonance, radio and microwave spectroscopy, as well as to the study of the properties of dielectrics and ferrite materials. Unfortunately, except for a brief sketch of the reflection of radio waves from the ionosphere, little mention is made of the use of microwaves as a tool for investigating the physics of plasmas. A chapter devoted to the proper measurements of such parameters as power attenuation, frequency, impedance, and so on, would not seem out of place in such a volume although they have not been included. On the other hand, one chapter, Chapter 8, is devoted to the study of artificial lines and filters, and I doubt whether this subject merits such detailed attention in view of the many other subjects that are not treated in the book at all.

It would appear as if this book were really two books under a single cover. In the middle of the book there is a sharp change in subject matter and continuity, and interest is focused on the physics of electron tubes and their applications. The treatment is generally good and based on fundamental principles. The reader is taken logically through the field of ultrahigh-frequency electronics with a discussion of klystrons, traveling-wave tubes, and magnetrons. Notable by its absence, however, is any treatment of solid-state electronics or any discussion of the solid-state diodes, transistors, tunnel diodes, or crystal detectors. It would seem that a chapter could have been devoted to this subject in the interests of completeness. The final chapter is concerned with a discussion of probability theory and noise, which is useful and necessary to much of the work encountered in the field of electronics.

Somewhat disappointing is the sparseness of the