

experimental methods he describes, but it is a better balanced work and more logically planned. On the other hand, perhaps none of the chapters is as clear, accurate and complete as the best in the present book—for example, Chapters 8 and 11. The type is bold and the book is pleasantly produced. The index is extremely brief.

There is no doubt that many people engaged in testing insecticides will find this book useful and convenient as a reference work. But there is equally no doubt that the general planning of the book and the contents of some of the chapters could have been considerably better. The ideal reference work on this subject has still to be written. W. A. L. DAVID

## NOISE THEORY

### Principles and Applications of Random Noise Theory

By Dr. Julius S. Bendat. Pp. xxi + 431. (New York : John Wiley and Sons, Inc. ; London : Chapman and Hall, Ltd., 1958.) 88s. net.

**N**OW that electrical science has within its grasp a wide variety of instruments of ever-increasing sensitivity, it is imperative that the design of such instruments should be such that the information obtained from them should be as little as possible dependent on random external influences. This problem occurs again in the general field of communication where it is desired to identify some desired signal in the presence of some completely masking spurious signals. The available knowledge in these fields has been collated and amplified in this book by Dr. J. S. Bendat.

It is essentially a book for the advanced student in the field of noise investigations, although the introductory chapters do give a very clear review of the basic mathematical concepts on which all the theory is developed. Correlation functions are here defined and the special significance to the engineer of the exponential-cosine correlation function is very wisely stressed. Other important concepts included in this introductory section are power spectra and their relationship with correlation functions, and also sampling theorems.

The book develops with a fairly detailed study of probability theory ; its applications to a number of random variable situations follow, well illustrated by a few simple engineering problems. As a final consideration, a situation outside that where the normal distribution holds is considered, namely, the case of the distribution of a noise envelope.

With this background, the ultimate object of the book becomes apparent in the next chapter. This is devoted to an investigation of the design of a network which will produce with any specified error some stated function of an input signal which has been degenerated with noise. This analysis is extremely general, being an extension of the pioneer work of Wiener to less restricted situations. The further problem of separating a desired signal from two received signals, both of which are degenerated by independent random signals, is also considered and illustrated by a deep problem on control.

The author now illustrates the wide applicability of the exponential-cosine autocorrelation function by a consideration of a number of varied practical systems in which it is applicable.

In a practical determination of the errors of a system to which such an input is applied, computer techniques are very desirable. The design of analogue computers for such simulation studies is considered. The errors in autocorrelation measurements are studied, first with particular reference to signals that are random in the video range and later for signals which have first been demodulated from radio frequencies either by a linear or a square law detector.

The topic is exceedingly thoroughly treated by the author, and, although essentially of a mathematical nature, he has not failed to keep the essential engineering nature of the problem before him. R. A. KING

## AVAILABLE ENERGY IN THERMODYNAMICS

### La Thermodynamique et le Théorème de l'Énergie Utilisable

Par R. Marchal. Pp. xxx + 208 + 7 planches. (Paris : Dunod, 1956.) 1580 francs.

**I**T would appear that the author of this book felt a mission to bring to the notice of engineers the concepts and theorems of available energy, which are too frequently ignored in engineering text-books. The chapter in which this subject is treated well repays close study, although it would be possible to improve on some of the methods of presentation. Unfortunately, the preceding five chapters, on the first and second laws and the properties of perfect gases, cannot be recommended as a good introduction to the later chapter.

In the preface the author sets himself against a course which, in attempting to be a monument of deductive logic, loses contact with reality, but he goes to the other extreme in failing too often to define his terms clearly. Failure to define 'heat' results in surprising confusion of thought in several places. In the presentation of the first law, system analysis is perfunctory and no mention is made of control surface analysis as such ; this may account for a confusion between thermodynamic cycles undergone by systems and mechanical cycles of operation of engines. These confusions place severe obstacles in the way of students hoping to understand the later and more worth-while chapter on available energy.

Many will not agree with the author, a professor in the École Nationale Supérieure de l'Aéronautique, that the ease of their mathematical treatment justifies the early introduction of perfect gases, which receive undue prominence in the text. Nevertheless, their use permits the presentation of two very interesting charts showing the available energy (availability) in non-flow and steady-flow as a function of the temperature and pressure ratios of system and environment. The author does well to point out in a footnote that the chemist's uses of the functions  $F$  and  $G$  result as special cases from the engineer's more general study of availability functions, although the book does not deal with the analysis of combustion problems or chemical reactions. The last chapter, on the representation of fluid properties, contains a useful but brief treatment of characteristic functions.

While a study of the chapter on available energy may prove rewarding, the book cannot be recommended as a standard text on thermodynamics.

R. W. HAYWOOD