work is outlined, there follow nine chapters devoted to characteristic aspects of the problem of abundances. These arise largely from the different methods of observation and analysis that are employed; e.g., the geochemist uses the tools of the laboratory, whereas the astrophysicist must rely on optical and radio telescopes, spectrometers, and photometers. Appended to each chapter is a list of selected references.

Although "qualitatively the composition of the most distant regions of the universe yet observed with the spectrograph resembles that of our local region", yet there are regions—stars and nebulae—where deviations from normal abundances occur. For example, the artificial element technetium has been found in some stars although it does not occur in most stars, including the sun. Other "abnormalities" might be cited. Problems of this sort require further investigation, for which the need and inspiration are found in Aller's book.

Physical Chemistry in Aerodynamics and Space Flight. Conf. Proc. (U. of Penna., Philadelphia, Sept. 1959). A. L. Myerson and A. C. Harrison, eds. 288 pp. Pergamon Press Inc., New York, 1961. $17.50. *Reviewed by Henry Wise, Stanford Research Institute.*

IN September 1959 a conference was held at the University of Pennsylvania on the subject that bears the title of this book. Because of technological advances, the interplay of chemical kinetics and fluid dynamics under extreme conditions of high temperature and low pressure offers a new challenge to the physical chemist. From a chemical viewpoint, the reacting species are simple, such as atoms and diatomic molecules, ions, and electrons. Their reactions with solid surfaces, their interaction with each other in the gas phase, and the transport properties of a reactive system form the subjects discussed at this conference. A total of 35 papers were presented. They ranged in scope from short papers to lengthy reviews. It is difficult to avoid heterogeneity in such an undertaking. Indeed, this volume contains an assemblage of loosely related papers such as one finds in a scientific journal. However, a common denominator appears as one glances over the various contributions; that is, the lack of fundamental information available on the properties and chemical kinetics of systems encountered in the upper atmosphere.

What scientific purpose is served by binding these papers together into a rather expensive hard-cover book? The printed discussions attached to some of the papers are meager, the symbols used are as different as the authors, and the publication of this book required more than one year. Because of the scope of the papers presented and the problems involved it would be desirable to circulate the contents of this book not only among the specialists concerned with space flight but also among the molecular physicists, the spectroscopists, the physical chemists, etc. The prohibitive cost of this publication may defeat such a distribution.

Lectures in Theoretical Physics, Volume 2. (Summer Institute, U. of Colo., Boulder, 1959). Wesley E. Brittin and B. W. Downs, eds. 483 pp. Interscience Publishers, Inc., New York, 1960. $9.00. *Reviewed by H. Mendlowitz, National Bureau of Standards.*

EIGHT articles representing most of the seminar lectures given the summer of '59 at the Summer Institute for Theoretical Physics held in Boulder make up this volume. It is quite clear that the levels of the various lectures were not uniform although, in such an institute, the same audience would probably attend most of the lectures. The reports on the lectures were not always prepared by the lecturer, but presumably they do represent the type and contents of the lectures.

The lectures that were most easily followed, partly because of the nature of the subject and partly because of the method of presentation, were those by W. E. Lamb, Jr., on quantum-mechanical amplifiers. A student with a year of quantum mechanics could very easily study this article. At the other extreme, were the lectures by A. Salam on invariance properties in elementary-particle physics and those by J. Sakurai on symmetry laws and elementary-particle interactions. An advanced student would require much hard work to master the contents of their reports. The others varied somewhat between these two extremes. Some were more complete than others, but, in general, an advanced graduate student in theoretical physics should not have too much difficulty in deriving a pretty clear picture of the various fields reported upon. I want to add a remark here regarding Dresden's lectures on aspects of abstract field theory. It is that one gets a feeling of excitement running through many portions of this report, and one feels that he is standing on the brink of either "boom or bust". Overall, I do think that this book is a worthwhile addition to the literature on contemporary physics.

General Relativity and Gravitational Waves. By J. Weber. Vol. 10 of Tracts of Physics and Astronomy, edited by R. E. Marshak. 200 pp. Interscience Publishers, Inc., New York, 1961. Clothbound $4.50, paperbound $2.50. *Reviewed by R. Bruce Lindsay, Brown University.*

ONE of the important issues in the general theory of relativity which is attracting much current interest is the question of gravitational radiation. The author of the book under review has recently devoted a great deal of attention to the problem of detecting and generating gravitational waves and has been one of the leaders in this line of research. Nearly a third of the book is devoted to this topic, the rest being a brief review of the fundamental principles of general relativity as employed for text purposes in Professor Weber's course on this subject at the University of Maryland.

Though the mathematical treatment of the fundamentals follows conventional lines, the book is somewhat unusual in the emphasis placed on experimental

tests and possible extensions of these. This is particularly true in the case of gravitational radiation. The author discusses not only the radiation from a spinning rod, first investigated by Einstein and Eddington many years ago, but also the more recent work of Foures-Bruhat, Brill, and Araki in which the field equations are regarded as imposing requirements on the initial values of the fields as well as predicting their future evolution.

In many ways the most interesting chapter in the book is the one on the detection and generation of gravitational waves, based almost entirely on the author's own work. There is a thorough discussion of a mass quadrupole detector consisting of two masses joined by a spring, and the average absorption cross section for gravitational radiation is calculated. The interaction of a crystal with a gravitational wave is also examined, and the special case in which the crystal is piezoelectric is shown to be worthy of test in the attempt to detect interstellar gravitational waves. Such experiments are planned at the University of Maryland together with others in which the earth itself is used as an antenna. The use of quartz resonators as radiators of gravitational waves is suggested. The magnitude of the task here confronting the acoustician who goes in for gravitation is indicated by the estimate of the author that, to radiate 10^{-15} ergs/sec at the fundamental frequency, 10^6 crystals would be necessary, each half an acoustic wave length thick and with a cross-sectional area of 50 cm^2! The signal-to-noise-ratio problem here is indeed formidable.

The author is to be congratulated on the effort he and his colleagues are devoting to this fascinating field of gravitational radiation. All physicists will wish them well and will look forward with interest to their results.

Boolean Algebra and Its Applications. By J. Eldon Whitesitt. 182 pp. Addison-Wesley Publishing Co., Inc., Reading, Mass., 1961. $6.75. *Reviewed by Peter L. Balise, University of Washington.*

THIS is a most lucid and well-balanced introduction to Boolean algebra, even for those with limited mathematical background. The algebra of sets is introduced in the first chapter and Chapter 7 extends it into fundamental probability theory. Chapter 2 is a formal presentation of Boolean algebra as an abstract system, independent of applications, and Chapter 3 provides a foundation in symbolic logic. Circuit algebra, probably the most important application, is dealt with in Chapters 4, 5, and 6. However in the preface Dr. Whitesitt emphasizes the three major applications, and thus dispels from the outset the commonly held limited views of Boolean algebra.

The purist may well object, but, in this reviewer's experience, an intuitive approach to a mathematical subject preceding rigorous treatment provides good motivation for mathematics majors. Thus the first chapter, with its immediate use of Venn diagrams, is an attractive introduction. Dr. Whitesitt bases only this chapter on intuition; the other applications follow the axiomatic presentation of Boolean algebra in Chapter 2. However, the entire book is supported by empathic explanations and excellent problems, leavened with humor, such as:

> The irascible husband carried his new bride across the threshold and then remarked, 'We'll get along fine, Honey, provided you observe the following rules: (a) At any meal when you do not serve bread, you must serve ice cream. (b) If you serve both bread and ice cream at the same meal, then you must not serve dill pickles. (c) If dill pickles are served, or bread is not served, then ice cream must not be served.' The bride was willing to comply, but was a bit confused about how to remember these somewhat involved rules. The problem was to simplify the rules.

Inevitably, because of its small size, the book treats no subject in detail and omits many topics. It will not satisfy every mathematician; and, for example, the mechanical engineer may object to the neglect of hydraulic circuits. But it is a very readable and informative text which should please most students and teachers.

Transformation de Fourier et Théorie des Distributions. By J. Arsac. 347 pp. Dunod, Paris, 1961. 48 NF. *Reviewed by J. Gillis, Weizmann Institute of Science.*

DISTRIBUTION theory represents one of those fundamentally new analytical ideas which are so extremely rare in mathematics. Up to now there have been three distinct approaches to the subject: the Fourier integral method of the French school, the essentially Cantorian method of Temple and Lighthill, and Mikusinski's symbolic approach. The book under review relies on the first of these and would appear to be intended primarily for physicists.

In point of fact, many physicists will find that the chief contribution of distribution theory is to justify what they have already been doing for years. There is a tale of an evangelical preacher who preached of heaven and hell with such zeal and success that he was rewarded by being allowed a short visit to both of these establishments. His first sermon on his return to earth began "Brethren, the lies which I have been telling you all these years are all true!"

However there is practical value in having such things justified; for example, that one can now know exactly what may be done with a delta function and how far one can go without falling into error. Heaviside rightly criticized the orthodox mathematicians who left problems unsolved rather than use divergent series to solve them. And he showed that the solutions obtained by his less orthodox methods were correct. But it is only since the modern theory of divergent series was developed by Borel, Hardy, Littlewood, and others that one could use the method scientifically, i.e., understand when the method would yield a correct result and why it would fail in other cases. One