

tion in thermodynamics" and in Falk and Jung's thesis that a consistent analysis of the physical situation demonstrates that there is no need to use the temperature concept. Although they claim this to be true in principle they do, of course, introduce the temperature as a useful secondary concept and they also show that the concept of a negative temperature recently introduced by N. F. Ramsey fits into the proposed formalism.

It is known from classical thermodynamics that the direction of irreversible processes such as electrical and heat conduction, chemical reactions, etc. insures an increase of the entropy of closed systems. The theory can be extended to relate the rate of such processes to the rate of the entropy increase. This formalism is discussed by J. Meixner and H. G. Reik in their article "Thermodynamik der irreversiblen Prozesse". This is a phenomenological theory which centers around linear equations—similar to Ohm's law—between various fluxes and forces. Reciprocity relations between the coefficients of these equations which have been developed by Onsager are derived from kinetic theory. As an application the effect of irreversible processes on sound propagation is investigated.

Every article of this volume touched upon so far makes extensive use of statistical concepts. Anyone capable of reading this book has certainly acquired some familiarity with these concepts and understands them intuitively. The mathematician, considering statistics as being in his bailiwick, rightfully frowns upon intuition as an ambiguous point of departure. To provide a solid basis for the physicist who wishes to employ statistical concepts, Alladi Ramakrishnan undertakes in the last article "Probability and Stochastic Processes" a presentation of stochastic theory. The emphasis is on results which the physicist can use "without being diverted by mathematical details or trammelled by the demands of rigour".

In toto this is a very useful collection of articles worthy of the reputation of the *Handbuch*. It is remarkably up to date with ample references to the original literature. It is an interesting sidelight that both Guggenheim and Ramakrishnan have decided that certain thoughts they wanted to express have been expressed to perfection by previous authors, i.e., Tolman and Khinchin; with permission of the publishers they have incorporated the respective passages into their texts.

The Magnetodynamics of Conducting Fluids: Symp. Proc. (Palo Alto, Calif., Nov. 1958). Edited by Daniel Bershadler. 145 pp. Stanford U. Press, Stanford, Calif., 1959. \$4.50. Reviewed by J. Gillis, *The Weizmann Institute of Science*.

THE development of magnetohydrodynamics during recent years has been so vigorous and on so wide a front that any textbook on the subject would probably be out of date before it was printed. Cowling's excellent little book was a notable exception, but that is chiefly

Ready in August

An Introduction to Quantum Mechanics

BY ROBERT H. DICKE, *Princeton University*
AND JAMES P. WITKE, *R. C. A. Laboratories*

An introduction to the physical concepts and mathematical formulations of nonrelativistic quantum mechanics, designed as a textbook for courses at the advanced undergraduate-graduate level. A knowledge of calculus and some familiarity with differential equations is assumed, as well as knowledge of basic undergraduate-level physics, including classical mechanics.

The opening chapters of the book suggest how the basic concepts of classical mechanics must be altered to explain many atomic-scale phenomena, and lay the groundwork for the more formal, postulational approach to quantum mechanics which follows. This part of the book, in which the emphasis is on a grasp of the fundamental principles and their mathematical formulation, with a minimum of involved mathematical manipulations, forms an ideal introduction to the subject for the undergraduate.

The concluding section, of eight chapters, represents a considerable broadening of the viewpoint and of the scope of the problems that can be handled. Of especial importance is the final chapter, dealing with quantum statistical mechanics, wherein techniques that are playing an ever-increasing role in modern physics are developed. Throughout the text, emphasis is given to algebraic techniques, and their power and elegance are clearly shown.

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because it was mainly concerned with basic principles and ideas. To keep up with current advances one has to rely on original papers scattered through a great number of scientific journals.

In such circumstances one welcomes the modern revival of the classical symposium. The Palo Alto research laboratory of the Lockheed Missiles and Space Division has for some years now been sponsoring an annual symposium on magnetohydrodynamics, and the volume under review has arisen from the third of these, held in November 1958. Perhaps the best way to indicate the scope of the book would be to list the individual contributions:

Problems of Flow Existence and Stability by A. Busemann; Magnetohydrodynamic Waves by J. D. Cole; Wave Propagation Without Radial Attenuation by H. Grad; Flow with a Transverse Magnetic Field by M. Mitchner; Supersonic Two-Dimensional Flow by Fishman, Locktrop, Patrick, and Petschek; Electromagnetic Interaction with Aerodynamic Flows by E. L. Resler, Jr., and J. E. McCune; and Flow Past a Flat Plate by Carrier and Greenspan.

The Symposium was chaired by Prof. F. Clauser, who has added a thoughtful little introduction to the book. The whole has been competently edited by Prof. D. Bershadner, and the result is an attractive volume. The reader who takes the trouble to work through the papers presented here will find it a sure, but not easy, road towards an understanding of this very complex subject.

Magnetohydrodynamics is a field in which theory has always been a long way ahead of experiment. It is therefore refreshing to observe how some of the lectures in this collection, particularly the fourth and fifth, have managed to include, and make the best of, all the relevant experimental material.

Methods of Experimental Physics. L. Marton, Editor-in-Chief. Vol. 1, Classical Methods, edited by Immanuel Estermann. 596 pp. Academic Press Inc., New York, 1959. \$12.80. *Reviewed by Sanborn C. Brown, Massachusetts Institute of Technology.*

THE editing of handbooks, encyclopedias, and technical series has ever been a popular labor of physicists, and the seven-volume series of *Methods of Experimental Physics* is the latest of these to start. The first volume on classical methods deals primarily with mechanics, acoustics, heat and thermodynamics, optics, electricity, and magnetism.

As is frequently true of collections written by many authors, the excellence of the chapters is by no means uniform. For example, the first chapter on evaluation of measurements is too short and sketchy to be really useful to an experimenter but too long merely to guide the reader to literature helpful in a particular measurement evaluation. I would also question the necessity of beginning every book on mechanics with the time-honored scheme of an introduction into the theory of errors.

The second chapter is also below the standard of most of the book. It seems written rather to annoy than to discuss in a definitive way the fundamental units and constants. Thus, despite the author's or the reader's prejudices, it seems rather unnecessary for a physicist outside the educational field to conclude his definition of force, which, incidentally, is not correctly defined, with the statement, "The gravitational system is, therefore, one of inherently lower accuracy than the absolute system and its only advantage appears to be a dubious pedagogical one." Having noted with some amusement that the centigrade scale was studiously avoided in favor of the Celsius nomenclature, I looked through the whole book to see whether the element tungsten was referred to as wolfram. (It was not.) I should also point out that this chapter on fundamental units did not deign to discuss the mks system of units.

After laboring through the first two chapters, I found the intellectual sophistication of the remainder of the book very high, and the few comments below are diminutia rather than general adverse criticism of the book.

For a volume published in 1959 to discuss high vacuum as 10^{-6} atmospheres is very much out of date, and to spend many pages on four vacuum pumps and low-pressure devices without a discussion of the modern ultrahigh vacuum technique is a serious omission, since the technology of this art since 1950 is completely revolutionized and should be recognized as such by all writers on experimental methods.

One of the puzzles in a book on experimental physics is the inclusion of a 25-page survey of thermodynamics. Although these 25 pages are perfectly satisfactory, their message can be found in any elementary text on heat, and I cannot fathom the reason for putting them into a volume on experimental methods.

Another problem arises in the chapter on electrostatics in which a one-page discussion of the use of an electrolytic tank is given with essentially no information on the modern counterpart of the electrolytic method or the generalization of the two-dimensional technique to the three-dimensional technique. It seems to me that "classical methods" should not necessarily mean old-fashioned methods but should cover competently the subject matter of "classical" physics. There are many places in the book where the authors limit themselves too much in scope and avoid the modern technology of classical subjects to the detriment of the volume's usefulness.

In conclusion, I would say that the volume on Classical Methods has some very good treatments of techniques discussed in its pages, but that the treatment is very uneven and tends to suffer from a lack of the modern technology developed within the last five years on the measuring methodology of the classical field of physics. However, a valuable attempt has been made to bring together in a single volume a large number of detailed concepts and techniques in the fields of mechanics, sound, heat, light, and electricity and magnetism.