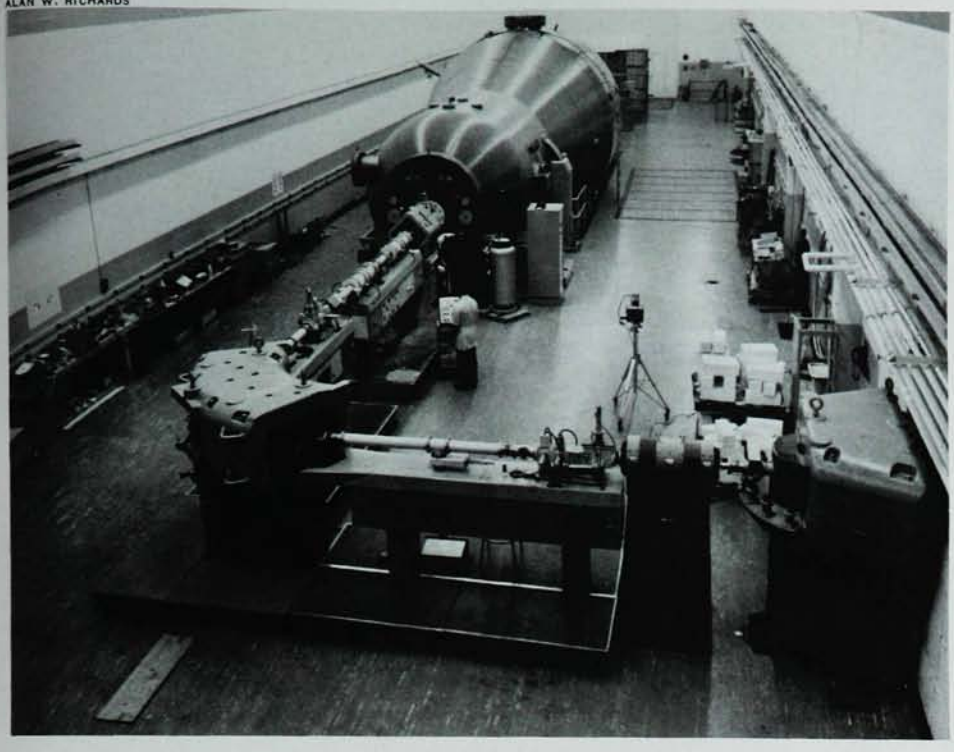
ALAN W. RICHARDS



EMPEROR TANDEM Van de Graaff at Yale with magnets and beam piping.

as a detailed reference for an intermediate general-physics course. It is clear and concise and covers the subject matter treated extremely well. The book, however, is deficient in its coverage of applications, and the author fails to point out in a specific manner the importance of applications. However, he does point out quite clearly the limitations of each type of accelerator and the difficulties that have been overcome in the time sequence of machine development. He also treats, in a remarkably clear manner, the way in which each of the original restrictions were overcome.

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Norman A. Baily is a radiological physicist and professor of radiology at the University of California, San Diego.

Shock-wave technique

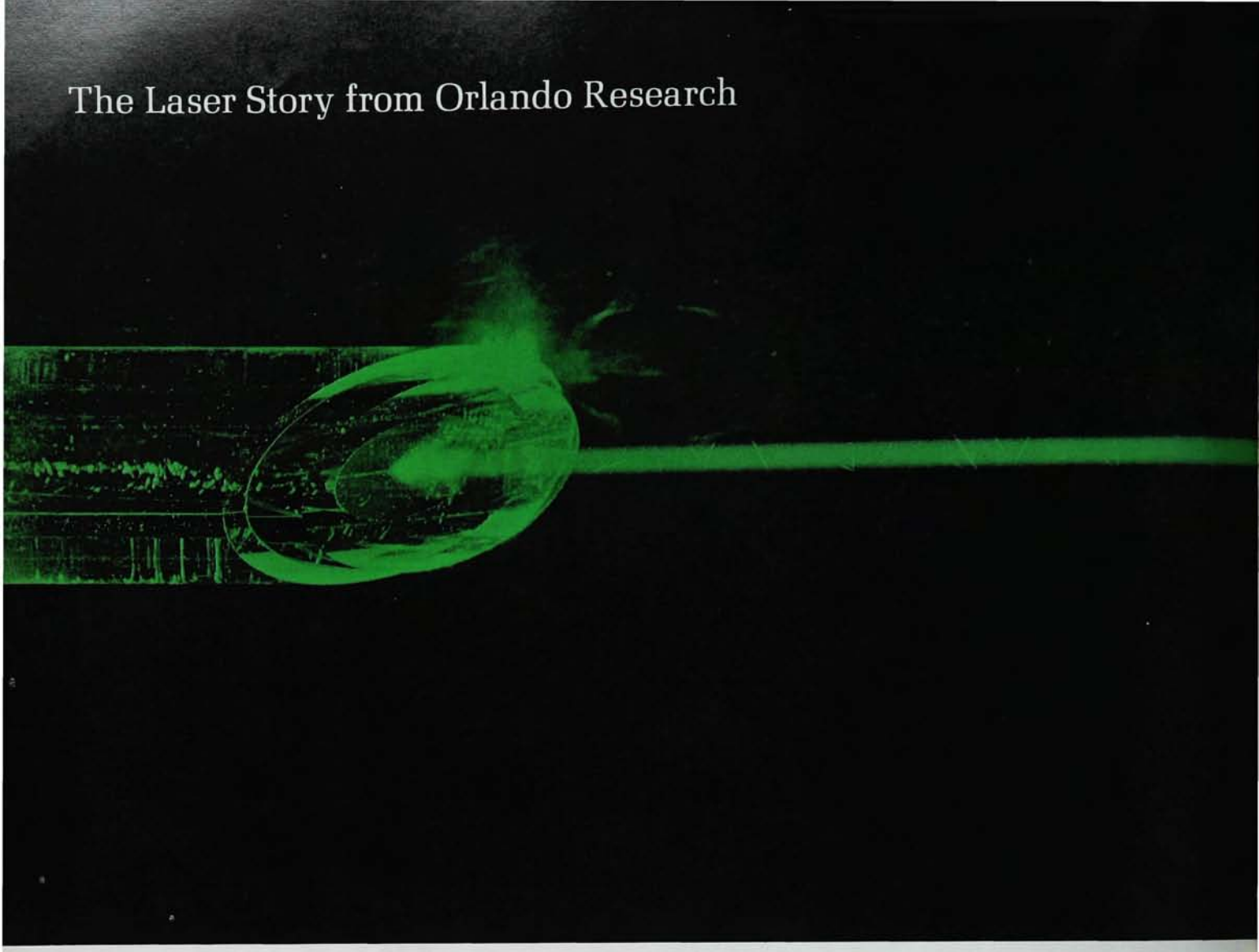
RELAXATION IN SHOCK WAVES. By Ye. V. Stupochenko, S. A. Losev, A. I. Osipov. (Trans. from Russian) 394 pp. Springer–Verlag, New York, 1967. $18.00

by EUGENE WIGNER

Shock waves are of considerable interest to the physicist, the physical chemist and also to the chemist. The gradual deformation of the front of a pressure wave, until its leading edge becomes so sharp as to represent a discontinuity in pressure, temperature and velocity, is in itself a surprising phenomenon. It occurs if the initial amplitude of the pressure wave is so high that the second-order terms in the hydrodynamic equation are more effective than those due to viscosity and heat conductivity. The original explanation of the phenomenon by Bernhard Riemann went hand in hand with his discovery of the method of characteristics to solve differential equations.

The theory of shock waves is of great importance for gauging the effect of explosions, and much of what we know about them originates in weapons laboratories. The present volume, however, describes their use for physical measurements, such as the measurement of the rate at which translational energy is converted into rotational and vibrational energy in gases or causes dissociation and ionization. The term "relaxation" in the title of the book refers to the establishment of equilibrium between the energy contents of the translational, rotational and vibrational degrees of freedom. Shock waves are particularly suited for the measurement of rapid processes, because the period during which the shock passes through any part of the material—and hence the period during which this is exposed to the shock's elevated temperature—can be made very short, even as compared with the time of equilibration of rather fast processes.

The Laser Story from Orlando Research



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The book contains six chapters. The first chapter gives a very condensed description of Riemann's theory of shock waves and then outlines the applications of shock waves for rate measurements. It gives, in fact, a very brief summary of these measurements. The second chapter describes the experimental facilities for the creation of shock waves and some of the properties of these. The third chapter describes the use of the shock waves for carrying out the measurements, such as the ways in which one can measure the magnitude of the very rapid changes that take place in various materials as a result of the passage of shock waves. The last three chapters give experimental results, that is, rate determinations carried out by means of the techniques described in earlier chapters.

Unquestionably one could learn a great deal from this book. Its collection of 626 references should in itself prove of great value for many purposes. The quite unusual sloppiness is, however, very disturbing. The number of contradictory statements in the book is so large that it is difficult to choose examples for them. Often a single page contains conflicting statements. Thus page 36 says that, "When considering vibrational relaxation it is possible to assume in the first approximation that at each time instant there exists a Maxwellian velocity distribution and a Boltzmann distribution of rotational levels." About 15 lines later, the authors say: "For all other molecules, the equilibrium with respect to the vibrational and rotational degrees of freedom is established almost simultaneously." Even more disturbing than such unexplained contradictions—which are quite numerous—are passages that give one the impression that the authors copied statements from the articles of other writers without taking the trouble to translate the statements into a uniform terminology and to compare their conclusions. One gains the impression that the true interest of the authors centers on the techniques of creating shock waves and not on the physical measurements that can be carried out by means of them.

* * *

Eugene Wigner is Thomas D. Jones Professor of Mathematical Physics at Princeton University. A winner of the 1963 Nobel Prize, he is known for his wide range of interests.

Debye on molecular forces

MOLECULAR FORCES BASED ON THE BAKER LECTURES OF PETER J. W. DEBYE. By Benjamin Chu. 176 pp. Wiley (Interscience), New York, 1967.

by STANLEY WEISSMAN

This little book is based on a short course, the Baker Lectures, given by Peter J. W. Debye at Cornell University. The author, Benjamin Chu of the University of Kansas, claims that "the style and contents of the lectures have been partially preserved so that readers may enjoy some of the penetrating remarks and insights from one of the great masters in the field." One certainly gets the impression that Chu has been successful because the style and presentation of the material is as pleasant and charming as the topics allow. Among these subjects are van der Waal's equation, which is discussed in some detail; clustering and its relation to the Debye–Hückel theory; intermolecular forces, that is, the orientation effect, the induction effect and dispersion forces including retardation; forces between macroscopic objects, and stability conditions for colloids. There is a long last chapter on electromagnetic scattering in various types of media and a detailed discussion of critical opalescence.

PETER J. W. DEBYE

Another aim of the author is to provide a stimulant to ". . . a renewed interest to the general scientist in the application of molecular forces to problems in chemical physics." It should be noted, however, that there is already at present a good deal of interest in molecular forces, for example