

able and worthwhile effort has been put into the discussion of relativity. Original points of view appear in several places.

The book would be well suited to a course for arts majors, but for engineers and science majors a deeper treatment of fewer subjects would be preferable.

Deformation, Strain, and Flow: an elementary introduction to rheology (2nd Revised Ed.). By Markus Reiner. 347 pp. Interscience Publishers, Inc., New York, 1960. \$9.75. *Reviewed by Herbert Leaderman, National Bureau of Standards.*

RHEOLOGY, from the phenomenological point of view, may be considered as a branch of mechanics that deals with the relationship between forces and deformations in bodies when this relationship follows neither the classical Hookean nor Newtonian behavior. Rheology by custom has come to include methods of measurement of the viscosity of liquids manifesting Newtonian behavior.

Technologists, especially those with an engineering or chemical background, are frequently called upon to assess the mechanical properties of such materials. While it is easy to devise mechanical tests from which numbers can be obtained, it is not always true that such numbers relate directly to fundamental rheological behavior or to practical performance. Recent treatises at an advanced level are guides to the scientific design and interpretation of experiments. These treatises are however of limited value to the technologist or beginning rheologist, whose knowledge of the mechanics of continuous media may be confined to elementary expositions of Hookean and Newtonian behavior.

The present volume represents the fourth in a series of texts by the author dating back to the ten lectures in theoretical rheology of 1943. In this book, a revision of the 1949 edition, he endeavors to present in simple mathematical language the principles of the phenomenological rheology of non-Hookean solids and non-Newtonian fluids. This work, as explained by the author in the preface, is based upon lectures given to an audience of chemists; for such people, for example, a bending test to yield Young's modulus is discussed in detail. In many cases full discussions are given of fundamental concepts. The scope of the book and the practical applications cover the experimental fields with which the author has been personally related—asphalt, polymer solutions, concrete, and metals. While the concepts and terminology, which correspond generally with those of the earlier volumes, do not always agree with current ones, the student should have no difficulty in relating Professor Reiner's approach to that of the more recent, more advanced, and generally more mathematical treatises.

The discursive personal style, justified by the author in the introduction, makes perhaps for easier reading than the usual dry and impersonal approach of other works on the subject. The treatment of the subject matter follows generally historical lines, and thus pre-

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sents for the advanced reader a valuable history of the slow and painful development of modern concepts. However, it may be argued that this treatment, together with the choice of subject matter, presentation, and experimental examples, may at times misguide rather than enlighten the elementary reader with limited background.

The difference between the contents of this edition and those of the first (1949) edition lies principally in the considerable rearrangement of the subject matter and new work with which the author has been connected, for example, the "teapot effect", and normal stress phenomena in liquids and in air. Much of this work is still controversial. Nevertheless, the volume represents the sole attempt by a competent rheologist to present in extenso the fundamental concepts of rheology for an audience of limited mathematical and mechanical background. In spite of these drawbacks and reservations the present work should be of value to such an audience wishing to obtain a first look into the field of modern scientific rheology.

Paramagnetic Resonance in Solids. By William Low. Suppl. 2 of Solid State Physics: Advances in Research and Applications, edited by Frederick Seitz and David Turnbull. 212 pp. Academic Press Inc., New York, 1960. \$7.50. Reviewed by Mendel Sachs, Lockheed Missiles and Space Division.

THE study of solids, by means of the paramagnetic resonance technique, has been a very fruitful one in providing an extremely accurate determination of many of the macroscopic properties of materials which are (even slightly) paramagnetic. This field of research, which has developed since World War II, has provided much information to complement the results of earlier experimental techniques (such as the low-temperature experiments) as well as much new information about paramagnetic solids. The quantity of work done in this field since 1946 has been enormous and Dr. Low is certainly correct in his remarks that it is time for a text to appear, designed primarily to discuss those basic principles which underlie the interpretation of all of these data. Such a text should collect, synthesize, and expand upon the development of the pertinent results which have appeared in the literature.

The book under review definitely fulfills part of this need. It provides an excellent survey of much of the important work which has appeared in the literature (with adequate references) and synthesizes the experimental observations with the theoretical results.

An outline of the theory of crystalline fields and a large cross section of corresponding data are followed by a review of the theory of relaxation times and line width, a short but lucid discussion of the action of the solid-state maser, a very brief summary of important work which has appeared in the literature on the subject of the paramagnetic resonance of color centers and defects in crystals, and finally an outline of the tools of this field of research, i.e., the various types of