and the authors are to be congratulated for the excellent presentation.

Of more limited scope is the book *Management Organization and the Computer*, which is the proceedings of a seminar sponsored by the graduate school of business of the University of Chicago and by the McKinsey Foundation. This book is concerned with the changes a company has to undergo when a computer is introduced. It contains articles relating to what the editors call information technology as well as articles relating to the concepts and problems of organization. An additional series of articles involves the experience of five companies that have installed computers. Many of these papers are followed with discussions and comments made by the participants; these remarks help clarify the subject matter. The book is intended for the higher levels of management where major decisions are made; the decision to install a data-processing system in a company, with all the upheaval involved in such an act, is indeed a major decision. However, in view of the rapidly increasing flow of information throughout the business enterprise, the question is not whether to install a computer, but rather how to do it most efficiently. This book should help to find the answer.

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Henry Cavendish. His life and scientific work. A. J. Berry. Hutchinson, London, 1960. 208 pp. Illus. 35s.

When Cavendish died in 1810, Humphry Davy said of him: "His name will be an object of more veneration in future ages than at the present moment . . . it will remain illustrious in the annals of science. . ." In a biography of Cavendish published in 1851, George Wilson probed deeply into the "water controversy" between Priestley, Watt, Cavendish, and Lavoisier; Wilson's study of what these men meant by *inflammable air* and *phlogiston* is still indispensable to the specialist. Since then, Cavendish's many unpublished papers have become available in print. Now Berry gives us the first comprehensive survey of this work which extended to many different fields of science. This man of "morbid shyness and timidity" had "the remarkable gift of knowing almost intuitively what kinds of problems were worth investigation" (page 21). Berry considers him to be the founder of water analysis and points out that Cavendish had clear concepts of chemical proportions and equivalent weights. In a paper published in 1781, Cavendish spoke of the particles of his electric fluid, but he adhered to Newton's opinion of heat as the internal motion of the particles of bodies against Black's hypothesis of a matter of heat. In his electrical researches he was, as Maxwell said, "his own galvanometer." This master of the accurate experiment noticed that "1/120 of the bulk of the phlogisticated air" remained unreactive. More than a century later this observation led to the discovery of the inert gases. Berry's account here conflicts with that of Ramsay himself.

The historians of science will be grateful to Berry for his well-balanced and thorough study. Those interested in "the" scientific method will find here much to capture their attention, particularly in Cavendish's approach to the problem of the "Electric Ray or Torpedo." Berry has painted a fascinating picture of a living embodiment of that abstraction, the pure scientist.

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Progress in Solid Mechanics. vol. 1. I. N. Sneddon and R. Hill, Eds. North-Holland, Amsterdam; Interscience, New York, 1960. xii + 448 pp. $15.50.

The aims and scope of this book are best described by quoting from its preface: "At the present time the mechanics of solids is perhaps the most rapidly expanding branch of applied mathematics. . . . It is becoming more and more desirable for engineers and physicists as well as applied mathematicians to study solid mechanics as a whole, and yet increasingly difficult for them to do so since important papers may appear in journals of widely differing character. This impasse may be met only by review articles of the highest standard which from time to time summarize and unify the most recent work in a particular field or group of fields. The present volume is the first in a series directed toward that end. The papers it contains are mainly concerned with reviewing recent theoretical studies in solid mechanics, but it is hoped that future volumes will contain surveys of recent experimental investigations. . . . The main emphasis [of this series] will be on basic principles and mathematical techniques of continuum mechanics, in all its aspects, together with experimental work of a fundamental kind."

The British editors are well qualified for this task, and it may be said that this first volume is highly successful in meeting the purpose set forth in the preface. Five of the contributors are British, and there is one each from Germany, Holland, and Japan. Five of the chapters cover subjects of rather broad general interest, while the other three discussions present results of more limited scope, yet of considerable interest.

The chapter on viscoelastic waves, by S. C. Hunter, is an interesting and logically developed account of the recent work on wave propagation in viscoelastic (or anelastic) materials. Both the Fourier and Laplace transform approaches are covered, with both their equivalence and the cases in which one or the other approach has practical advantages clearly pointed out. The various formulations of the constitutive equations applicable to linear materials showing viscoelastic or anelastic behavior are derived in a fashion suitable for the purposes of this chapter, although neither this section nor the discussion of the experimental results for polymers is, or was intended to be, complete.

The material on matrices of transmission in beam problems, by K. Marguerre, presents a formulation of the dynamics of framed structures with members of variable section not necessarily straight. Torsion can also be included. This paper should be of value to engineers and computers interested in numerical analysis.

H. G. Hopkins discusses the dynamic expansion of spherical cavities in metals produced by explosive loading. Although it is necessary to introduce drastic simplifications—such as neglect of the outgoing shock wave in the metal and the oscillatory character of the gas pressure in the early stages—in order to obtain a manageable problem, nevertheless it is possible to reach conclusions of both practical and theoretical interest.

W. T. Koiter presents a concise but quite complete survey of the general theorems of the mathematical theory of plasticity for isotropic bodies. Existence and uniqueness theorems are discussed, together with minimum principles and the bounds associated with limit analysis, including plastic collapse and shakedown. Qualifications of the theorems are carefully stated. The development of this aspect of the theory of plasticity has reached relative maturity, and this review not only summarizes the material effectively but also gives the historical perspective of the development.

The presence of even the simplest boundaries in an elastic body with some finite dimensions introduces great complications in the behavior of elastic waves; in particular, there is usually dispersion. Because of the widespread use of high-frequency mechanical systems, such as crystal oscillators, marked interest has been shown in this subject in recent years. W. A. Green treats one aspect of this matter in a rather individualistic article on the dispersion of elastic waves in bars. The simplest case is the infinite bar of circular cross section, for which a formal solution was given by Pochhammer as early as 1876, but the complicated results have received quantitative study only in recent years. The dispersion curves for axial, torsional, and flexural waves consist, in each case, of an infinite number of branches. Exact solutions for cross sections other than circular have not yet been found. Consequently there has been much interest in approximate solutions, which are discussed at some length in the article. Where possible, comparisons are made with the lowest branch of the Pochhammer solution, but no attention is drawn to the fact that most of the theories furnish no approximations to the higher branches. The article concludes with an interesting discussion of the complications introduced when the Pochhammer theory is enlarged to include more than one nodal plane through the axis of the bar.

The account of the dynamical theory of thermoelasticity, presented by P. Chadwick, is as lucid and readable as any I have seen. A derivation of the field equations and the linearized constitutive relations in an isotropic body is followed by an extended account of plane harmonic thermoelastic waves in the manner of Biot. Lockett's analysis of thermoelastic Rayleigh waves, a treatment of the thermoelastic Pochhammer-Chree problem for an infinite circular cylinder, and a treatment of both axially and radially symmetric problems are presented. Following Biot, the author derives the constitutive relations in terms of the variables associated with the free energy—that is, the strain (or displacement) and the temperature. It is perhaps regrettable that the utility of the remaining thermodynamic functions is not exploited. For instance, consideration of the enthalpy leads directly to equations in the stress and (through the entropy) the heat flux, a very convenient choice in a problem such as that of a metallic rod driven by pulsed radiation incident on one end.

The concise review of continuous distributions of dislocations by B. A. Bilby, one who was most active in founding the theory, deals almost exclusively with the pertinent kinematics—that is, with formulation and physical interpretation of the relevant geometry. Since the discussion covers a wide variety of investigations, sometimes very briefly, it is impracticable to describe the contents in detail. Fundamental in the theory is a non-Riemannian geometry, involving an asymmetric affine connection. The antisymmetric part of this connection describes the distribution of dislocations. Curves everywhere tangent to crystallographic vectors are paths in this geometry, paths being analogs of the straight lines in Euclidean geometry. With this geometry and conventional kinematics, one can describe macroscopic "shape" deformation, lattice distortion, and deformation associated with introduction or movement of dislocations. These ideas are developed in some detail and correlated with dislocation theory. This approach promises to play an important role in the development of the mechanics of crystalline solids, and the present review provides a good starting point for those interested in learning what it entails.

The number of significant solutions to three-dimensional problems in elasticity is small except where the number of space variables can be reduced by conditions of axial or radial symmetry. It is therefore welcome to see an extension to asymmetric problems of the powerful method of integral transforms associated with Sneddon. R. Muki discusses elastic and thermoelastic (steady state) problems associated with the semi-infinite solid and the thick plate. Specific cases include the inclined rigid cylindrical punch and arbitrary tangential loading on the semi-infinite solid. Both loaded areas are circular, and Hankel transforms are used. Two thermal stress problems are solved for the thick plate with circular heated areas.

Particularly noteworthy are the uniformly excellent bibliographies attached to each article.

I hope that succeeding volumes in this series will maintain the high standard set by the first.

I am indebted to J. L. Ericksen, Johns Hopkins University, for reviewing the article on continuous distribution of dislocations and to my colleagues, R. S. Marvin and Martin Greenspan, who were kind enough to review the articles on viscoelasticity and thermoelasticity, respectively.

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The American Civil Engineer. Origins and conflict. Daniel Hovey Calhoun. Technology Press and Harvard University Press, Cambridge, Mass., 1960. xiv + 295 pp. Illus. $5.50.

This history covers the tribulations of the civil engineer in the United States from the colonial era until the 1840's, when "civil engineers had become a definite occupational group." The author is most concerned with the period from 1816 (the beginning of the New York state canal system) through the depression of 1837–46; apparently the depression gave the engineer the leisure necessary to reflect on his calling and to recognize the need for a professional society.

The problem of defining his work was approached scientifically by the engineer himself as early as 1830 when Amos Eaton subdivided the work into *ochetology*, *odology*, *mylology*, and *stereology*! But, as Calhoun shows, the engineer found it difficult in practice to differentiate himself from capital, on the one hand, and labor, on the other. In my opinion, Calhoun's analysis of the "trend" of things is unduly complex. In essence, it seems that the engineer's problem was to become a sufficiently numerous species to demand definition, and this was accomplished, thanks to the proliferating transportation projects sponsored by the government in the early 19th century.

All this is told at somewhat greater length than necessary and with an emphasis on socioeconomic analysis which effectively submerges the undoubted romance of civil engineering in those days. But, in an area heretofore almost entirely given over to legend, it is refreshing to encounter a report so solidly based on fact and footnote.

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