Finite deformation of an elastic solid. By F. D. Murnaghan. New York, Wiley, 1951. 6+140 pp. $4.00.

Apparently intended as a text, this book follows the growing custom of beginning with an introductory chapter containing pure mathematics neither necessary nor sufficient for the applications which follow. The student is deterred from accepting the results without question by frequent interjections of "(why?)," "(prove this)," and other commands, and the pedagogical usefulness of the works is attested by the numerous simple exercises. The pages, whose crowding with symbols and parenthetical expressions in the text suggest that the publisher confused the manuscript with some work on topology or algebra, are rather frightening to look at.

The author maintains that the theory of finite deformations is most easily presented and understood by the use of matrices. "Do not fall into the error of regarding them as a complicated device invented by mathematicians to make the theory of elasticity harder than it actually is," he warns. However, the book did not furnish recreational reading to the reviewer, who finds the author's former tensorial treatment in the American Journal of Mathematics, 1937, not only more complete but also by virtue of its compact explicitness easier to grasp. At one point the author reverts to tensors, although taking care to advise readers to skip this passage, and later in the solution of special problems in curvilinear coordinates he employs without derivation equations which would develop naturally if an invariant formulation had been given to start with.

About forty pages are required to derive the classical equations of finite elastic strain. Next the author develops what he calls "the integrated linear theory" of hydrostatic pressure. This theory is obtained by taking the expression for change of volume in the linearized theory, then supposing the Lamé constants are linear functions of pressure, then integrating the result. He shows that by suitable choice of the constants occurring it is possible to get very good agreement with some of Bridgman's experiments. The numerical details are presented in full.

To consider the author's theory, let us repeat part of his presentation of the classical proof of the existence of stress-strain relations (pp. 55–56). Writing T for the stress matrix, η for the strain matrix, ρ_a and ρ_x for the density before and after deformation, J for the matrix of gradients of deformed with respect to undeformed positions, ψ for the mass density of the energy of deformation, and using a star to denote transposition, he says: "Since [the principle of con-