BOOK REVIEWS

Théorie relativiste des Fluides à Spin. Recherches sur la Dynamique du Corpuscule tournant relativiste et l'Hydrodynamique relativiste des Fluides dotés d'une Densité de Moment angulaire interne. No. 10 of Les grands Problèmes des Sciences. By Francis Halbwachs. 294 pp. Gauthier-Villars, Paris, 1960. Paperbound $12.50. *Reviewed by Nandor L. Balazs, Princeton University.*

WE all know how relativity theory brought together seemingly unrelated phenomena and provided an elegant framework to express these relationships. For example the Lorentz force, which originally was unrelated to the electric force acting on a charge, turned out to be simply connected to the electric force acting on a charge at *rest*; indeed, it was the same force viewed from a moving frame of reference and as such it was also a simple consequence of the relativistic transformation laws of the electromagnetic field. Also, the fact that in any theory only Lorentz invariant objects can figure, suggested natural ways to extend results which were only known in the nonrelativistic limit, as the development of relativistic mechanics and hydrodynamics shows.

Since 1925 we have been prone to think of the spinning electron as a small rigid sphere endowed with an intrinsic angular momentum about its center of mass. During the past thirty years a body of literature grew up to give this model a relativistic form. The difficulties were great, since relativistically a rigid body does not exist, and in relativistic dynamics the mass center and angular momentum turn out to be very sophisticated concepts. Therefore the relativistic model finally adopted turned out to be a fluid carrying an intrinsic angular momentum density. If one wishes, one can treat this fluid as an object of interest of its own, or as a representative fluid related to the wave function of a spinning particle, as has been done by Madelung in the past, and more recently by Bohm and Vigier, the author of this book, and others.

The present book develops in an admirably clear manner the whole theory of fluids endowed with an intrinsic spin. First, the author describes the relativistic dynamics of a spinning point particle; here, he provides a careful discussion of the difficult concepts of relativistic centers of mass, spin tensor, spin four-vector, etc. Next, he treats the relativistic hydrodynamics of the representative fluid constructed from the wave functions of a particle. Finally, he discusses the classical relativistic hydrodynamics of a fluid composed of spinning point particles. The diverse treatments and methods which appear in the literature are clearly presented, and they emerge here as special cases of a unified treatment. (The only objection I have is that no reference is made to the works of Kramers, *Collected Scientific Papers,* North-Holland Publishing Co., Amsterdam, 1956, pp. 677, 683; Synge, *Relativity: The Special Theory,* North-Holland Publishing Co., Amsterdam, 1956; and Bargmann, Michel, and Telegdi, Phys. Rev. Letters, **2**, 435 (1959) all contributing greatly to this subject.) As an additional gift, the author gives an excellent summary of ordinary relativistic hydrodynamics in Appendix B, and a lucid discussion of the relativistic conservation laws and their relation to the invariance properties of the Lagrangian in Appendix C. (The printing of the book is excellent, which in itself is an achievement considering the abundance of symbols with many indexes in relativity.)

This book should be read by everybody who likes clarity and elegance in the presentation of a difficult subject.

Theory of Thermal Stresses. By Bruno A. Boley and Jerome H. Weiner. 586 pp. John Wiley & Sons, Inc., New York, 1960. $15.50. *Reviewed by Ellis H. Dill, University of Washington.*

THIS book is concerned with the analysis of a solid body when it is subjected to specified heating conditions: the determination of the temperature distribution and the stress distribution. It is primarily of interest to the research worker and the practicing engineer, but it is also suitable for a graduate-level text. As a reference work, it is the only good treatment available. The authors should be especially commended for the completeness and for the numerous references to the technical literature; in this respect, the book ranks as a treatise.

The first of the four parts contains a complete and elegant presentation of the basic theory. It begins with a statement of the thermodynamical and mechanical foundations of the subject and proceeds to a complete formulation of the coupled boundary-value problem for the isotropic elastic and linear viscoelastic solids. Indicial notation, the summation convention, and vector representation are used. It then deals with the formulation of the uncoupled quasistatic thermoelastic problem, formulation of the thermoelastic problem in either stress or strain, and two-dimensional problems.

The second part is devoted to the formulation and solution of the uncoupled temperature distribution problem, i.e., to the Fourier heat conduction equation. Solutions to basic problems are presented and the