reported and edited by L. Dunoyer in 1913, and finally printed by the author in 1916 with a mathematical appendix supplementing the text, these lectures may be characterized as a frank discussion of some of the most troublesome points in recent thermodynamical theories. Lorentz never throws dust in the reader's eyes; whatever is doubtful is plainly so labeled; that which is tentative is distinguished from that which is settled; the physical ideas are discussed with a minimum of mathematics, and all extended analytical work is reserved for the appendix, where it can neither befog nor interrupt the even tenor of the work.

The relation of entropy to probability in classical thermodynamics, with applications to monatomic gases and other substances, the effect of the size of molecules, the comparison of two possible definitions of probability (Boltzmann and Einstein), canonical ensembles (Gibbs), and fluctuations in statistical phenomena are treated in the first three lectures. The last topic is of great importance and of recent development, with applications to the emission of α particles, to the scattering of light, to Brownian motions, and to black body radiation (fourth lecture). The initial impulse in this field has been largely due to Einstein. Lorentz's connected exposition will be welcomed. A treatment of Planck's formula and of the theory of quanta, admirably honest, closes the set of five suggestive lectures. There is philosophy as well as physics in the work.

There is no other text which can be recommended as comparable with this for clarifying ideas in a very opaque field, and no great knowledge of mathematics or physics is a necessary preparation for enjoying the book, for sensing the exhilarating boldness of some recent theories, and for discerning possible directions of escape from present perplexities.

E. B. WILSON.

The Theory of Electrons and its Applications to the Phenomena of Light and Radiant Heat. By H. A. LORENTZ. Second Edition, Leipzig, B. G. Teubner, 1916. 343 pp.

THIS second edition of Lorentz's Theory of Electrons is practically identical with the first edition, except for a few changes in the footnotes and in the mathematical appendices or notes, which follow the main text. For the most part these changes are for the purpose of giving a clearer state-

ment of the theory of relativity and of the theory of quanta, subjects which were not as prominent in 1909 as they are at present. Except in these two matters, the theory of electrons has not progressed much in the last half dozen years. I need only refer, therefore, to my review of the first edition, BULLETIN, volume 17, pages 194–200.

E. B. WILSON.

Einführung in die theoretische Physik in zwei Bänden. Von CLEMENS SCHAEFER. Bd. I. *Mechanik materieller Punkte, Mechanik starrer Körper und Mechanik der Kontinua (Elastizität und Hydrodynamik).* Leipzig, Veit, 1914. xii + 925 pp. + 249 fig.

THE author, Dr. Schaefer, is well known for his popular and excellent introduction to Maxwell's theory. It was the success of this work, with its clear indication of Schaefer's ability as a writer, that led his friends to press him to publish an introduction to theoretical physics—a large work intended to cover a course of lectures four times a week for five or six semesters. There are not so many general treatises on theoretical physics of the scope of this one that the author need fear the chance of duplicating existing texts.

The present volume deals with mechanics taken in a broad way, covering the mechanics of a particle, of systems of particles, of rigid bodies, and of continua; that is, of fluids and elastic bodies.

The treatment of mechanics of a particle contains chapters upon kinematics, general principles of dynamics, special cases of motion (particularly oscillatory and including Foucault's experiments), general principles of dynamics of systems of particles and their application to special systems. As might be expected, the material does not differ very greatly in sort or in treatment from that found in treatises on the mechanics of a particle. The introduction of Coriolis's theorem on relative motion does, however, come somewhat earlier than usual. A small amount of vector analysis is used, being developed from time to time as it is needed. Moreover, there is a good and unusual section on free and forced oscillations of finite amplitude, which has interesting applications in a theory of sound, and there is a demonstration of Dirichlet that in a statical system the potential energy is at minimum for stable equilibrium—a fact which is often assumed without demon-