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 demonstration. Hamilton's principle and Lagrange's equations are also taken up before the theory of the motion of a system of particles is left.

The mechanics of rigid bodies starts with kinematics, in which there is given a considerable discussion of the geometry of rigid motion. The dynamical part is founded upon d'Alembert's principle, and in treating the momental ellipsoid a certain amount of the theory of the linear vector function is presented. The general theory of the dynamics of rigid bodies concludes with a section on statics and it may be well to point out that the author follows modern procedure in making statics depend upon dynamics. There is a considerable treatment of the theory of the top and of potential theory, including Poisson's equation.

The treatment of continua begins with the theory of infinitesimal displacement, of which the treatment is detailed even to the introduction of the divergence and curl. Dynamics, when applied to continuous media, begins with statics,—a procedure just the reverse of that followed in treating rigid bodies. We may well ask whether it is logical to indulge in this chiastic arrangement, and are we likely to maintain it, or shall we ultimately come to begin the theory of continua with kinetics, or may we revert to the old-fashioned method of putting statics everywhere before kinetics. After treating various cases of elastic equilibrium, the author takes up the motion of an infinite medium (wave motion) and follows it with the oscillations of strings and membranes; and here we find Green's functions and integral equations, which we should not have found, at any rate in the same form, in older texts, although Lord Rayleigh and Oliver Heaviside long ago used methods not wholly dissimilar. In more or less parallel fashion the author then takes up the oscillation of bars and plates.

Finally he goes on to hydromechanics, starting with equilibrium and with wave motion. He follows this with a chapter upon motion with a velocity potential including a treatment of Stokes's theorem. He gives particular attention, as is customary, to two-dimensional motion and develops a few cases of discontinuous motion wherein the theory of functions of a complex variable is used. The fundamental properties of vortex motion are well treated, and finally the theory of friction in liquids, which closes with a few words on turbulence and on Prandtl's investigations.

This rapid sketch of the contents of Schaefer's first volume will indicate that the method followed by the author is for the most part to treat fundamental theorems in detail and we may add with clearness, to give a few of the most important applications of the theorems, but to leave aside anything that would be considered as distinctly special and better suited to technical texts on the various branches of mechanics.

Here in America the work can scarcely be used otherwise than as a book of reference. Few universities, if any, offer a course, or are in a position to offer one, which should stretch an introduction to theoretical physics over five or six semesters with four lectures per week. Those of us who give courses on the subject generally find it better to proceed in a very different way; namely, to give in one course perhaps of three hours per week for a year of thirty weeks, a general introduction to mechanics, heat, light, and electricity, leaving the student at the end of the course in a position to undertake serious courses in the various branches of physics, such as rigid mechanics, hydrodynamics, elasticity, optics, thermodynamics, or electricity and magnetism. For our conditions this is undoubtedly a better arrangement because, after the one introductory year, the student is free to turn his attention intensively to any one of the major branches of physics, whereas on the plan followed by Dr. Schaefer, he would be methodically carried through each of the branches in about three years; thus, so far as I can see, getting in no one of those branches the detailed treatment which he would get of one or two of them under our method.

In teaching theoretical physics, it is comparatively easy to give a set of reasonably satisfactory lectures, and it is equally difficult to gather together as satisfactory a set of exercises for the student to work. Unfortunately, though the lecturer may find much in this book which will aid him in the preparation of his lectures, the teacher will find little or nothing which will give him hints of material suitable for assignment as exercises for his pupils, and somehow or other it seems to be true that without exercises American students, even the most industrious, do not gain the grip upon a subject and the insight into it which they should. English books, to a great extent, and French treatises to an increasing extent, are setting forth exercises for the student to work, and it may be hoped that sooner or later this style of composition may appear in Germany. From some points of view, placing exercises in a book like Dr. Schaefer's might appear uncalled for, and he can hardly be blamed for omitting them, but it is not difficult to believe that even in Germany students would appreciate their presence.

EDWIN BIDWELL WILSON.

NOTES.

THE second summer meeting of the Mathematical Association of America was held at Western Reserve University and the Case School of Applied Science, Cleveland, Ohio, on Thursday and Friday, September 6–7, 1917, immediately following the summer meeting of the American Mathematical Society. The joint dinner of the two organizations took place on Wednesday evening, and a joint session was held on Thursday morning at which Professor L. P. EISENHART, of Princeton University, delivered by invitation an address on "Darboux's contribution to geometry." The further programme included papers by H. E. HAWKES: "Undergraduate mathematical clubs," with discussion led by R. C. ARCHIBALD and D. A. ROTHROCK; E. R. HEDRICK, retiring presidential address: "The significance of mathematics"; E. B. STOUFFER: "Geometry for juniors and seniors," with discussion led by ARNOLD EMCH and L. W. DOWLING; L. C. PLANT: "The treatment of the applications in college courses in mathematics," with discussion led by W. A. HURWITZ and A. M. KENYON. An informal report on the activities of the national committee on mathematical requirements was presented by the chairman, J. W. YOUNG; this report will be published in an early number of the *American Mathematical Monthly*. Ninety persons, representing fifty-one institutions, attended the various sessions. The Council elected nine individuals and two institutions to membership.

THE American association for the advancement of science will hold its seventieth meeting at Pittsburgh from December 28 to January 2 under the presidency of T. W. RICHARDS, of Harvard University. The retiring presidential address will