SHORTER NOTICES

Einführung in die theoretische Physik. Von Clemens Schaefer. Band II, Teil 1. *Theorie der Wärme, Molekular-kinetische Theorie der Materie.* Berlin, Vereinigung wissenschaftlicher Verleger, 1921. x + 562 pp.

The first volume on mechanics (particles, rigid bodies and continua) when reviewed in these pages was signalized for its excellence of material and of style. The second volume continues the excellences of the first. The rest of the work will be awaited with interest, and, by those engaged in teaching theoretical physics, with impatience. It is a pity we cannot have such books in English. Twenty years ago there was hope that Andrew Gray's *Treatise on Physics* (of which vol. I, *Dynamics*, alone appeared) would fill this lacuna. Schaefer has written his present volume since the Armistice. He has been at Breslau and is now at Marburg.

There are eleven chapters as follows: 1. Heat conduction. 2. First Law of thermodynamics. 3. Second Law of thermodynamics. 4. Homogeneous systems. 5. Heterogeneous systems. 6. Special systems (gases and dilute solutions). 7. Chemical affinity and Nernst's theorem. 8. Kinetic theory of gases. 9. Entropy and probability. 10. Statistical mechanics. 11. Quantum theory.

The arrangement is logical. General old-fashioned theories of heat conduction and thermodynamics come first—general thermodynamics, be it noted, not the special idealized systems. The treatment of chemical affinity is more modern but at least in its main lines is now firmly established. The last four statistical chapters are excellent: no over-elaboration on ancient kinetic theory, a clear treatment of the fundamentals of statistical mechanics, and an excellent and convincing presentation of quantum theory so far as heat phenomena are concerned. Nothing is said of radiation—not even the Stefan law which sometimes is deduced from a Carnot cycle and could have been inserted in Chapter III as illustrative material.

The last few pages on Nernst's theory of the degeneration of ideal gases (Entartung) should have been omitted in a book of this kind. It is too special and not yet well enough substantiated either experimentally or theoretically (as the author notes). The space thus gained could well have been given to real gases, under which only van der Waals's equation is given, whereas for some not remote purposes other equations are useful; and for accurate descriptions of the behavior of substances over long ranges of temperature, pressure, and density, Keyes's equation is incomparably superior to van der Waals's.

Generally the mathematical treatment is elegant—not the elegance of the mathematical virtuoso, but that of the working physicist. (A notable exception is the painful summation, p. 502, of the series Σnx^n in place of its evaluation as the derivation of Σx^n multiplied by x.) In the main, physical concepts are kept well in the foreground throughout mathematical

discussions, and physical philosophy is delightfully in evidence throughout involved physical discussions. Tables of numerical data help at times to increase the effective reality of the work. One thing, however, continental authors disregard to their serious detriment, and that is exercises for the student. When exercises are well selected they double the educational value of any book. Schaefer has the teacher's instincts and could easily have furnished excellent exercises.

It would be only too easy to stretch this review to great lengths, mentioning such clear-cut analysis as that of Boltzmann's "ergodische" systems with its unusual frankness in pointing out that there are no such systems (p. 439), of the total separation of Liouville's theorem and the equipartition of energy, etc., of the discussion of anomalies (Schwankungen) and its bearing on the work of Perrin and his followers. But there are too many details to cite, and we had best not begin. Let the book be widely read.

EDWIN B. WILSON.

The Elements of Non-Euclidean Geometry. By D. M. Y. Sommerville. Chicago, The Open Court Publishing Company; and London, G. Bell and Sons, 1919.* xvi + 274 pp.

The printing of a second edition of this book, as well as the fact that it now, for the first time, appears as a publication of the Open Court Publishing Company, speaks well for the attention it has received from mathematical readers.

A careful comparison of the two editions shows no changes. The very few typographical errors and the somewhat more frequent unintended slips in the text remain. For instance, on p. 10, l. 20, a parenthesis is still lacking; likewise an "s" on p. 22, l. 1. There remains (p. 54) this remarkable series of statements:—"A triangle has therefore four circumcircles. ··· There cannot be more than one real circumcentre" [and may, of course, be none]. "This point, which we may call *the* circumcentre, ··· may be real, at infinity, or ideal." On p. 204, line 19, R is still called the earth's radius, although the radius of the earth's orbit is clearly meant.

It is to be sincerely hoped that the popularity of the book may before long require still another printing, and that a careful revision may then make it as accurate as it is interesting.

EDWARD S. ALLEN.

Annuaire du Bureau des Longitudes pour 1921. Publié par le Bureau des Longitudes. Paris, Gauthier-Villars, 1921. 7 + 710 + 130 pp.

Before 1904, each issue of the Annuaire contained all the information which the Bureau considered necessary for publication. Owing to the number of pages, which had gradually increased, it was then divided and certain articles in which there was little or no annual change were given only in alternate years. The volume has now grown again to a size which is near its maximum for convenient handling and one finds references which include the previous four volumes. Its chief annual feature is the full

* Originally published in 1914 by G. Bell and Sons, and reviewed in this BULLETIN, vol. 21, May, 1915, by J. L. Coolidge.