

*Leçons sur les Conduites.* By Charles Camichel. Paris, Gauthier-Villars, 1930. iii+101 pp.

This book on hydraulics is devoted to the discussion of the propagation of pressure waves in fluids in pipe-lines of constant and varying thickness. A minimum of the mathematical theory of hydrodynamics is assumed and the emphasis is placed on the industrial applications.

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*Counting and Measuring.* By H. von Helmholtz. Translated by Charlotte Lowe Bryan, with an Introduction and Notes by Harold T. Davis. New York, Van Nostrand, 1930. xxxiv+39 pp. \$2.50.

This is a translation of one of Helmholtz's well known contributions to the foundations of science. The question considered is: How can the concept of number be logically employed for the purpose of comparing physical magnitudes, and what attribute must the combination of magnitudes possess in order that it can logically be correlated with the addition of numbers? The concept of number itself is first examined and is made to depend on an intuitive time-sequence. The numbers so defined are of course the ordinals; the cardinals follow immediately by an appeal to the empirical process of counting. Both types of number are then shown to satisfy the axioms of arithmetic. Perhaps the most profound idea in this work is that the relation of equality between physical magnitudes satisfies the necessary axioms (and thereby is expressible as an equality between numbers) not on account of any law of nature; it is rather that the axioms determine what physical relations are to be regarded as relations of equality. Similarly the physical combinations which are to be regarded as addition are only those which satisfy the axioms of addition.

It is of course easy to criticize Helmholtz's treatment of number in the light of modern mathematical logic and his treatment of mensuration in the light of modern physics. The significance of the present work seems therefore to be chiefly historical. In the introduction, which is entitled "A Survey of the Problem of mathematical Truth," Professor Davis says of this work that it "... stands historically in the midst of a stream of speculation which today has progressed far beyond its original mathematical bounds and has become an active force in some of the most fundamental thought of modern physics." This is Professor Davis's only reference in his survey to the work in question. He traces rather the course of this stream of speculation which started with the paradox of Zeno and has finally led to the Hilbert-Brouwer controversy, the "postulate of boundedness" of Eddington, and the "principle of indeterminacy" of Heisenberg. But in spite of recent intellectual floods, one gathers from the last sentence of the survey, which contains Poincaré's scornful remark about logistics, that the problem of mathematical truth remains unsolved. One wonders why Professor Davis did not comment further on Helmholtz's ideas and more completely evaluate the work to which the book is devoted. One will agree, however, that this work is in many ways a masterpiece and thoroughly worth translating. It is the work of a great physicist who saw the need of scrutinizing critically the logical foundations of his science; the importance of such examination is being realized today as never before.

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