Das Prinzip der Kleinsten Wirkung von Leibniz bis zur Gegenwart. By Adolf Kneser. (Vol. IX of the Wissenschaftliche Grundfragen, edited by R. Hönigswald.) Leipzig, Teubner, 1928. 70 pp.

The principle of least action is treated in this little book from an historic and philosophic point of view. While the formulation of the concept "action" varies as it is applied in one field or another, the fact that it is possible to envisage a great diversity of natural phenomena as solutions of problems which ask for the minimum or maximum of the "action integral" presents the philosopher with a remarkable opportunity for speculations concerning unity and harmony in nature. And this opportunity has been eagerly seized. Beginning with an account of the way in which the idea of the least-action principle took root in the work of Leibniz, the author traces its development by Leibniz, Euler, Helmholtz, and Planck. The contributions made by Maupertuis, after whom the principle is frequently named, are put in relation to those of Leibniz and Euler; and the work of the erstwhile president of the Prussian Academy of Sciences, as far as it is concerned with the least-action principle, is not deemed of great value. Besides, it seems that priority for a formulation of the principle belongs to Leibniz rather than to Maupertuis "who indeed never succeeded in reaching an exact formulation of his principle nor in making a single correct application of it."

Of great interest are the connections which the author establishes between this principle and the studies on the bases of science made by various philosophers. There are numerous quotations from Kant's *Critique of Judgment*, to whose ideas on the nature of the cosmos the principle of least action is shown to bear important relations.

If this principle is to be regarded as of general significance in the physical universe, there is opened up an alluring field for speculation. For in its character as a principle of natural economy it is, at least superficially, in striking contrast with the prodigality which characterizes the organic world.

The collection of monographs of which the book under review is one, is a valuable aid in the study of fundamental questions in a wide variety of fields of knowledge.

ARNOLD DRESDEN

Integralgleichungen, unter besonderer Berücksichtigung der Anwendungen. By G. Wiarda. Leipzig and Berlin, B. G. Teubner, 1930. ii+183 pp.

This small book of five chapters is intended as a simple introduction to the theory of integral equations. Its announced purpose is to inspire the interest of the student of pure mathematics and to be of use to the student of applied mathematics. The book treats exclusively the Fredholm equation of the second kind and centers upon the Schmidt theory as most directly adapted to the applications. The exposition is elementary and should be readable to the student versed in the calculus and the fundamentals of the theory of infinite series. The author does not disdain at opportune points to illustrate his deductions by calculations in specific examples.

The compass of the book is small and the treatment accordingly affords few digressions from the central theme into related fields. Even the relation between integral and differential equations is but briefly treated. This feature may perhaps recommend the book to students who wish merely to dip into the subject. Others will find little here that is new, and yet the reviewer found the book distinctly pleasant to read. The exposition is carefully and skillfully done. Definitions and theorems are conspicuously set forth, and the author has taken pains to keep the reader informed at all times as to his purpose and the proposed means for its accomplishment.

The contents of the book may be briefly summarized. Chapter 1, designed to motivate the study of the integral equation, is given mainly to a rather detailed consideration of the physical problem presented by the stretched string under both free and forced vibration. It includes also the formulation of a problem in optics. Chapter 2 is purely mathematical, and contains a systematic exposition of the fundamental theorems of the Schmidt-Hilbert theory of the equation with a symmetric kernel. Chapter 3, entitled "Applications," considers the problems of the flow of heat in a rod, and of the deflection of a loaded beam. The practical computation of a solution by the method of successive approximations is briefly developed. Chapter 4 is devoted to the equation with an unsymmetric kernel; and finally in Chapter 5 a short outline of the Fredholm theory is given.

To those who would form an acquaintance with this branch of mathematical theory and its applications to physical problems, the book might well be recommended.

R. E. LANGER

Comptes Rendus du Septième Congrès des Mathématiciens Scandinaves tenu à Oslo 19–22 août, 1929. Oslo, A. W. Brögger, 1930. 1919+7 pp.

Comptes Rendus du Premier Congrès des Mathématiciens des Pays Slaves. Warsaw, Ksiaznica Atlas, 1930. 239+4 pp.

The first Scandinavian mathematical congress was held in Stockholm during 1909 on the initiative of Mittag-Leffler. The meetings have since been continued at irregular intervals alternating between the capitals of the four Scandinavian countries. The present congress was held in Norway in connection with the commemoration of the centennial of N. H. Abel's death. The proceedings contain 22 papers, almost all published in international languages. Some interesting expository lectures are also included in the proceedings. The list of authors includes: Alander, Ahlfors, Arwin, Brun, Danielson, Engstrom, Fjeldstad, Heegaard, Jessen, Juel, Nagell, F. Nevanlinna, R. Nevanlinna, Nystrom, Ore, Rasch, Rasmussen, Rode, Skolem, Selberg, Tambs-Lyche.

The first congress of mathematicians from the Slavic countries was held in Warsaw in September, 1929. The proceedings contain 54 papers, about half of them in the Polish language. The authors are: Bydzovsky, Chwistek, Dickstein, Dusl, Fréchet, Golab, Hadamard, Härlen, Hoborski, Hosiasson, Hostinsky, Jarnik, Kaczmarz, Karamata, Kawaguchi, Kempisty, Knaster, Kolodziejczyk, Koutsky, Kuratowski, Leja, Lubelski, Mazurkiewicz, Menger, Milicer-Gruzewska, Neyman, Nikodym, Obreschkoff, Petr, Petrovitch, Peyovitch, Popoff, Popova, Presburger, Rychlik, Saltykow, Sergescu, Sierpinski, Sieczka, Slebodzinski, Steinhaus, Szpilrajn, Tschakaloff, Vitali, Wazewski.

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