

Part III, in which the numerical solution of algebraic equations is taken up, is left practically unchanged.

In Part IV, theory and application of determinants, the chapter on linear equations (Chapter XXVI) has been almost completely rewritten by Dr. Perron. The subject is now presented more systematically, by the reduction of the solution of a system of  $n$  linear non-homogeneous equations in  $n$  variables to the solution of a system of  $n$  linear homogeneous equations in  $n + 1$  variables. By introducing the notion of rank of a matrix (formerly postponed to the last chapter in the book) the results are stated more compactly. Although the treatment of this subject has thereby become much clearer, it seems to the reviewer that still further progress towards unifying it can be made, as is shown for instance on pages 43–53 of Bôcher's *Introduction to Higher Algebra*.

Probably in order to remove the objection to the proof of the multiplication theorem as given in the first edition, raised, for instance, in Professor Dickson's review, the theorem is now introduced that a determinant is an irreducible function of its  $n^2$  elements whereby the difficulty referred to is removed.

One regrets the scarcity of geometrical illustrations and interpretations. The numerous examples illustrating the methods presented make the book valuable for the student. It seems strange that the treatment of determinants should be left for the last section of the book; if presented earlier, the subject of elimination, which is fully treated and is now taken up in Part I and again in Part IV, could be discussed more compactly. The presentation is on the whole very clear; it goes step by step and leads gradually to a full understanding of the topics discussed, which furnish a good introduction to the study of algebra.

It is remarkable, that while the typographical errors of the first edition have been corrected, nearly as many new ones have found their way into the second edition.

ARNOLD DRESDEN.

*Théorie mathématique des Assurances.* Par P. J. RICHARD et E. PETIT. Paris, Doin, 1908. 396 pp.

THE series of books coming out under the general title *Encyclopédie Scientifique* seems not to be very well known in this country, yet the enterprise is highly ambitious and indus-

triously carried on under the editorship of Dr. Toulouse of the *École des Hautes-Études*. The handy little volumes are "in 18 jésus cartonnés," which is better understood in the original than in a translation, contain about 400 pages, and sell uniformly at 5 francs. The individual volumes would doubtless carry considerable weight by themselves; but their value and influence is much enhanced by the fact that each fits into its appropriate nook in the vast *Encyclopédie Scientifique*, which is divided into 40 sections and which will contain about 1000 volumes in all. The fact that the volumes are printed separately makes it possible to keep them revised and up-to-date; the fact that they belong to a series serves as a check on unnecessary repetition; the limited but not too limited size of the volumes allows each to give a good idea of its field without developing into a ponderous treatise. The sub-editors under Toulouse are Painlevé for the philosophy of science, Drach for mathematics and for mechanics, D'Ocagne for applied mathematics and for applied mechanics; and the supervisors in other fields are equally qualified for their tasks.

Richard and Petit, who write the volume on insurance, are actuaries and graduates of the *École Polytechnique*. They have produced a book in the spirit of the whole series, readable, yet not merely popular. The theory of insurance is developed in general and is applied to the discussion of numerous kinds of policies. The standard mortality tables are those compulsory in France; the types of policy treated in greatest detail are those most in vogue in France. This is but natural, and naturally the book will be most serviceable in France. But the foundation of the work is so carefully laid that it may be of value in any country. The authors do not overlook the fact that in several instances the insurance companies find it necessary for business reasons to adopt a procedure not wholly in accord with that which the theory would indicate as most rational. Unfortunately insurance has to contend with the psychology of the insured and insurable. This is nowise more evident than from the fact that the French government, which for forty years has maintained an insurance department guaranteed by the state, with smaller premiums than the private companies, and with no requirement for a medical examination, has written only about a million and a half dollars of insurance in the whole period! This cannot be attributed to partiality against the state; for the government old-age pensions or insurance are

a great success, the receipts for 1906 alone being over forty million dollars. The attitude of the authors throughout is that of practical as well as scientific actuaries.

E. B. WILSON.

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NOTES.

PROFESSOR KLEIN'S Evanston Colloquium Lectures on Mathematics, which have for some years been out of print, have been republished by the AMERICAN MATHEMATICAL SOCIETY and are now on sale at the nominal price of seventy-five cents per copy, postage free. The new edition is printed from the original plates, with correction of a few misprints. A brief preface by Professor W. F. OSGOOD has been added. The volumes are bound like the original. Orders should be addressed to the American Mathematical Society, 501 West 116th Street, New York, N. Y.

THE April number (volume 12, number 2) of the *Transactions of the American Mathematical Society* contains the following papers: "Biorthogonal systems of functions," by ANNA J. PELL; "Applications of biorthogonal systems of functions to the theory of integral equations," by ANNA J. PELL; "On the uniform convergence of the developments in Bessel functions," by C. N. MOORE; "Determination of the ordinary and modular linear groups," by H. H. MITCHELL; "General theory of linear difference equations," by G. D. BIRKHOFF.

THE April number (volume 33, number 2) of the *American Journal of Mathematics* contains: "On three-spreads satisfying four or more homogeneous linear partial differential equations of the second order," by C. H. SISAM; "Some properties of lines in space of four dimensions and their interpretation in the geometry of the circle in space of three dimensions," by C. L. MOORE; "On the geometry of line elements in the plane with reference to osculating circles," by G. F. GUNDELFINGER; "Binary modular groups and their invariants," by L. E. DICKSON; "The group of turns and slides and the geometry of turbines," by EDWARD KASNER.

AFTER the completion of the present volume, the *Annals of Mathematics* will be published under the auspices of Princeton University instead of Harvard University as heretofore. The