

Edgeworth points out—the variations between two given series of index numbers according to different systems are within the range of probable error, and therefore inconclusive. What an amount of controversy might have been saved by general recognition of this fact.

To those interested in the theory of averages mention may be made of the appendices, in which are detailed the elementary propositions relating to the arithmetic, geometric and harmonic means, with single and multiple weighting.

The logical method of the work is admirable, its index most complete, but it leaves the reader with the impression that further work must be done and that no one solution will cover what is really a considerable number of independent problems.

J. M. GAINES.

#### NOTES.

THE closing (October) number of volume 3 of the *Transactions* of the AMERICAN MATHEMATICAL SOCIETY contains the following papers: "On the groups of order  $p^m$  which contain operators of order  $p^{m-2}$ ," by G. A. MILLER; "On the circuits of plane curves," by C. A. SCOTT; "Note on the real inflexions of plane curves," by C. A. SCOTT; "La théorie des plaques élastiques planes," by J. HADAMARD; "Covariants of systems of linear differential equations and applications to the theory of ruled surfaces," by E. J. WILCZYNSKI; "On the rank, order and class of algebraic minimum curves," by A. S. GALE; "On superosculating quadric surfaces," by H. MASCHKE; "Algebraic transformations of a complex variable realized by linkages," by A. EMCH; "On the determination of the distance between two points in space of  $m$  dimensions," by H. F. BLICHFELDT; "A definition of abstract groups," by E. H. MOORE; notes and errata: volumes 1, 2, 3.

THE October number (volume 24, number 4) of the *American Journal of Mathematics* contains: "On systems of linear differential equations of the first order," by M. BÔCHER; "On the quaternary linear homogeneous group and the ternary linear fractional group," by T. M. PUTNAM; "On cardinal numbers," by A. N. WHITEHEAD; "On a method of constructing all the groups of order  $p^m$ ," by G. A. MILLER; "Non-euclidean

properties of plane cubics and of their first and second polars," by H. F. STECKER.

AT the meeting of the British association for the advancement of science held at Belfast, September 10–12, the president of Section A, Professor JOHN PURSER, took as the subject of his opening address an historical sketch of the Irish school of mathematics and physics. Sir NORMAN LOCKYER was elected president of the association for the coming year. The meeting in 1903 will be held at Southport, beginning September 9, and in 1904 at Cambridge. It is probable that the meeting in 1905 will be held at Cape Town.

THE several universities below offer during the winter semester of the current academic year courses in mathematics as follows :

UNIVERSITY OF GIESSEN.—By Professor M. PASCH : Differential calculus and the elements of integral calculus, four hours ; Introduction to the theory of functions, two hours ; Exercises in the elements of higher mathematics (algebra, analytic geometry, differential and integral calculus), two hours ; Exercises in the mathematical seminar, one hour.—By Professor E. NETTO : Definite integrals and their applications, four hours ; Analytic geometry of space, four hours ; Exercises in the mathematical seminar.

UNIVERSITY OF GREIFSWALD.—By Professor W. THOMÉ : Algebra, four hours ; Theory of plane algebraic curves, two hours ; Mathematical seminar, two hours.—By Professor E. STUDY : Non-euclidean geometry, two hours ; Mechanics, four hours ; Mathematical seminar, two hours.—By Professor G. KOWALEWSKI : Introduction to analytic geometry, two hours ; Theory of continuous transformation groups, two hours ; On Fourier's series (with applications to mathematical physics), two hours.

UNIVERSITY OF HALLE.—By Professor A. WANGERIN : Integral calculus, with exercises, five hours ; Calculus of variations, two hours ; Hydrodynamics, two hours ; Exercises in the mathematical seminar, one hour.—By Dr. H. GRASSMANN : Exercises in descriptive geometry, one hour ; Analytic geometry of space, two hours ; Elements of descriptive geometry, two hours.

UNIVERSITY OF KÖNIGSBERG.—By Professor F. MEYER: Exercises in integral calculus, one hour; Integral calculus, four hours; Differential geometry, four hours; Exercises in differential geometry, one hour.—By Professor A. SCHOENFLIES: Mathematical seminar, two hours; Applications of elliptic functions to geometry, mechanics and mathematical physics, four hours.—By Professor L. SAALSCHÜTZ: Exercises in algebraic analysis, one hour; Theory of Fourier's series, two hours; Introduction to algebraic analysis, two hours.

UNIVERSITY OF MARBURG.—By Professor F. SCHOTTKY: Algebraic analysis, four hours; Mathematical seminar, two hours.—By Professor A. E. HESS: Integral calculus, five hours; Spherical trigonometry and its applications, two hours; Mathematical seminar, two hours.—By Dr. F. VON DALWIGK: Analytic geometry of space, especially surfaces of the second degree, four hours; Analytic geometry and graphic statics, with exercises, two hours; Advanced analytic geometry, one hour.—By Dr. H. JUNG: Algebra, four hours; Differential and integral calculus, four hours.

UNIVERSITY OF MÜNSTER.—By Professor W. KILLING: Analytic mechanics, five hours; Analytic geometry, five hours; Theory of transformation groups, two hours; Exercises in the mathematical proseminar, two hours; Exercises in analytic geometry, one hour.—By Professor R. VON LILIENTHAL: Differential and integral calculus, five hours; Introduction to the theory of differential equations, four hours; Exercises in the mathematical seminar, one hour.—By Dr. M. DEHN: Elliptic functions, three hours; Graphic statics, two hours; Exercises in the theory of functions, one hour.

UNIVERSITY OF INNSBRUCK.—By Professor O. STOLZ: Theory of double integrals, two hours; Elements of the calculus of variations, one hour; Exercises in these subjects in the mathematical seminar, one hour; Theory of functions of complex variables according to Cauchy and Weierstrass, three hours.—By Professor W. WIRTINGER: Higher algebra, three hours; Abelian functions, two hours; Mathematical seminar, two hours.—By Professor K. ZINDLER: Analytic geometry of the plane and of space, five hours; Mathematical seminar, one hour.

UNIVERSITY OF NEUCHÂTEL.—By Professor L. ISELY: Infinitesimal calculus, including differential equations, three

hours ; Analytic geometry of space, two hours ; Theory of numbers, one hour.—By Professor L. GABEREL : General theory of functions, two hours ; Abelian functions, one hour.

UNIVERSITY OF PRAGUE.—By Professor G. PICK : Differential and integral calculus, five hours ; Mathematical seminar, two hours.—By Professor J. A. GMEINER : Analytic geometry, three hours ; Double integrals, two hours ; Exercises in analytic geometry, one hour.—By Dr. W. WEISS : Elements of descriptive geometry, two hours.

UNIVERSITY OF TÜBINGEN. — By Professor A. VON BRILL : Introduction to higher mathematics, four hours ; Non-rigid systems and the mechanics of Hertz, three hours ; Seminar, two hours.—By Professor H. STAHL : Higher algebra, three hours ; Applications of the theory of functions, four hours ; Seminar, two hours. — By Professor L. MAURER : Definite integrals, two hours ; Differential equations, two hours ; The theory of ternary forms, one hour, with exercises, one hour ; Exercises in higher analysis, two hours.

UNIVERSITY OF VIENNA.—By Professor G. R. VON ESCHERICH : Elements of the differential and integral calculus, with particular reference to their common applications, five hours ; Exercises relating to these lectures, one hour ; Proseminar, one hour ; Seminar, two hours.—By Professor L. GEGENBAUER : Integral calculus and calculus of variations, three hours ; Theory of spherical and cylindrical functions, with applications to problems of theoretical physics, two hours ; Exercises in the mathematical proseminar, one hour ; Exercises in the mathematical seminar, two hours.—By Professor F. MERTENS : Theory of numbers, five hours ; Exercises in the mathematical seminar, two hours ; Exercises in the mathematical proseminar, one hour.—By Professor G. KOHN : Introduction to synthetic geometry, four hours ; Exercises relating to these lectures, one hour ; Theory of invariants with applications to geometry, two hours.—By Dr. A. TAUBER : The mathematics of life insurance, four hours ; Exercises relating to this course, two hours.—By Dr. E. BLASCHKE : Introduction to mathematical statics, second course, three hours.—By Dr. R. DAUBLEBSKY VON STERNECK : Applications of differential and integral calculus to geometry, two hours ; Theory of numbers, one hour.—By Dr. K. CARDA : Introduction to the theory of contact transformations.—By Dr. R. SCHRAM : Method of least squares, one

hour.—By Professor H. HARTL: Elements of descriptive geometry, with applications in constructions, four hours; Geodetic coördinates, with computations, one and one half hours.

PROFESSOR F. SCHOTTKY, of Marburg, has been appointed to succeed the late Professor L. FUCHS at the University of Berlin.

DR. ALFRED LOEWY, of the University of Freiburg, has been promoted to an associate professorship of mathematics.

DR. H. HOHENNER of Munich has been appointed professor of geodesy in the Technical high school in Stuttgart.

PROFESSOR D. A. GRAVÉ of Kharkov has been called to a professorship of mathematics in the University of Kieff.

DR. E. HAENTZSCHEL has been appointed professor of mathematics in the Technical high school in Berlin.

PROFESSORS R. HAUSSNER, of Giessen, and A. KRAZER, of Strassburg, have been called to the Polytechnic school at Carlsruhe.

PROFESSOR L. M. DEFOE, of the department of mathematics of the Missouri State University, has been appointed professor in charge of the department of mechanics in that institution. Professor Defoe will enter upon his new duties on his return from Europe where he is spending a year on leave of absence.

DR. F. H. SAFFORD has been appointed instructor in mathematics at the University of Pennsylvania.

PROFESSOR W. H. METZLER, of Syracuse University, has been elected to membership in the Royal Society of Edinburgh.

AT Yale University, Mr. W. D. A. WESTFALL has been appointed instructor in mathematics in the academic department, and Mr. BURKE SMITH in the Sheffield scientific school. Dr. H. E. HAWKES has resumed his duties as instructor. Dr. E. B. WILSON is spending a year's leave of absence abroad.

JOHN WHELDON & Co., 36 Great Queen Street, London, W. C., have recently issued a catalogue (No. 14) of second-hand mathematical works, containing nearly 800 entries.