

## NOTES.

THE second (April) number of Volume II of the *Transactions* of the AMERICAN MATHEMATICAL SOCIETY contains the following papers: "Canonical forms of quaternary abelian substitutions in an arbitrary Galois field," by L. E. DICKSON; "Certain cases in which the vanishing of the Wronskian is a sufficient condition for linear dependence," by M. BÔCHER; "An elementary proof of a theorem of Sturm," by M. BÔCHER; "On the determination of surfaces capable of conformal representation upon the plane in such a manner that geodesic lines are represented by algebraic curves," by H. F. STECKER; "On the existence of a minimum of the integral  $\int_{x_0}^{x_1} F(x, y, y') dx$  when  $x_0$  and  $x_1$  are conjugate points, and the geodesics on an ellipsoid of revolution; a revision of a theorem of Kneser's," by W. F. OSGOOD; "On the geometry of planes in a parabolic space of four dimensions," by I. STRINGHAM.

THE April number (second series, volume 2, number 3) of the *Annals of Mathematics* contains the following papers: "Sufficient conditions in the calculus of variations," by W. F. OSGOOD; "Lagrange's equation in the calculus of variations and the extension of a theorem of Erdmann," by J. K. WHITTEMORE; "On some points in the theory of the hypergeometric function, expressed as a double circuit integral," by R. M. HATHAWAY; "A theorem in continued fractions," by D. N. LEHMER; "Note on the dual of a focal property of the inscribed ellipse," by R. E. ALLARDICE; "A simplified solution of the cubic," by EMORY McCLINTOCK.

AT the regular meeting of the London mathematical society held on March 14, 1901, the following papers were read: "An account of some algebraical identities of simple arithmetical application," by Professor E. B. ELLIOTT; "Preliminary notice concerning the stability of motion," by Professor A. E. H. LOVE; "On the composition of group characteristics," by Professor W. BURNSIDE; "On the use of Cauchy's principal values in the double limit problems of the integral calculus," by Mr. G. H. HARDY.

THE following papers were read at the meeting of the Edinburgh mathematical society held on March 8, 1901: "Some elementary theorems regarding surds," by Professor G. CHRYSAL; "Note on the application of complex integra-

tion to the equations of conduction of heat," by Mr. J. DOUGALL.

THE first fasciculus of volume IV of the Encyclopaedia of the mathematical sciences (see *Bulletin*, volume 7, page 101) is to appear very shortly. It will contain "Vector analysis," by Dr. M. ABRAHAM of Göttingen, and Professor A. E. H. LOVE's two articles on "Hydrodynamics."

THE first fasciculus of volume 9 of the *Jahresberichte* of the German mathematical association has just appeared. It contains an announcement that volume 10 will include a report by Professor H. BURKHARDT entitled: "Die Ausbildung der Methode der Reihenentwickelungen an physikalischen Problemen."

THE Spanish journal *El Progreso matematico*, edited by D. ZOEL G. DE GALDEANO, Saragossa, ceased publication with the number for last December.

THE first two numbers of a new Italian monthly, *Le Matematiche pure ed applicate* have appeared. It is edited by Professor C. ALASIA of Oristano with the coöperation of twenty Italian and foreign mathematicians, and is published by S. Lapi in Città di Castello. The periodical will publish notes and memoirs on elementary and advanced mathematics, but preference will be given to articles on applied mathematics. The first number, which has twenty-four pages, begins with an article on continued fractions by the late Professor C. HERMITE. Contributions may be sent to the American member of the board of editors, Professor G. B. HALSTED, Austin, Texas.

THE announcement is made that Professor A. VON OETTINGEN of Leipsic has undertaken to edit Volume IV. of Poggendorff's Biographical Dictionary, which is to cover the period 1884-1900. Authors of works and articles in mathematics, physics, astronomy, meteorology, chemistry, mineralogy, geology, and geography have been asked to promote this undertaking by sending to Professor v. Oettingen biographical notices, and also information regarding books and articles published in periodicals which are not very widely known. The new volume will appear in 1902 or 1903, and will be published by J. A. Barth, of Leipsic.

CAMBRIDGE UNIVERSITY. The Smith's prizes have been adjudged to G. H. HARDY, fourth wrangler in 1898, for his essay on "Definite integrals of discontinuous functions,"

and to J. H. JEANS, bracketed second wrangler in 1898, for his essay on "The distribution of molecular energy." P. V. BEVAN, fourth wrangler in 1899, received an honorable mention for his essay on "The influence of metallic media on light vibrations."

THE UNIVERSITY OF CHICAGO.—The following advanced mathematical courses, four hours weekly, are to be offered during the four quarters (*su*, *a*, *w*, *sp*) of the year beginning June 19, 1901:—By Professor E. H. MOORE: Theory of functions of a real variable, with seminar (*a*, *w*, *sp*).—By Professor O. BOLZA: Theory of functions of a complex variable (*su*); Calculus of variations (*su*); Advanced algebra (*a*, *w*); Abelian functions, with seminar (*a*, *w*).—By Associate Professor H. MASCHKE: Theory of functions (*a*, *w*); Theory of the potential (*sp*); Theory of invariants (*a*); Twisted curves and surfaces, with seminar (*w*, *sp*).—By Assistant Professor H. E. SLAUGHT: Differential equations (*su*); Advanced integral calculus (*a*, *w*, *sp*).—By Assistant Professor J. W. A. YOUNG: Pedagogy of mathematics (*su*); Solid analytics (*sp*).—By Assistant Professor L. E. DICKSON: Pure and analytic projective geometry (*su*); Theory of numbers, with introduction to congruence groups (*sp*).—By Dr. J. A. BOYD: Solid analytics and determinants (*su*).—By Dr. McDONALD: Hyperelliptic functions (*su*).

COLUMBIA UNIVERSITY.—The following advanced courses are offered during the academic year 1901–1902 by the departments of mathematics and mechanics, each course extending throughout the year:—By Professor F. N. COLE: Theory of groups, three hours.—By Professor T. S. FISKE: Advanced calculus, three hours; Functions defined by linear differential equations, three hours.—By Professor J. MACLAY: Theory of functions of a complex variable, three hours.—By Professor M. I. PUPIN: Electromagnetic theory of light, two hours; Bessel's functions and spherical harmonics, one hour.—By Professor R. S. WOODWARD: Advanced theoretical mechanics, two hours; Theory of the potential function, two hours.—By Dr. E. KASNER: Theoretical mechanics, three hours.—By Mr. C. J. KEYSER: Modern theories of geometry, three hours.—By Mr. H. B. MITCHELL: Differential equations, three hours.—By Mr. J. C. PFISTER: Theoretical mechanics, two hours.

The mathematical colloquium is held fortnightly.

CORNELL UNIVERSITY.—Among the courses announced for the summer session, July 5th to August 16th, are ele-

mentary courses in algebra, geometry, trigonometry, analytic geometry, and infinitesimal calculus, given by Professors TANNER, JONES, WAIT, and Dr. MURRAY, and the following advanced courses:—By Professor L. A. WAIT: Analytic geometry, based on Salmon's conic sections, three hours; Differential calculus, based on the treatises of Todhunter and Williamson, two hours.—By Dr. V. SNYDER: Projective geometry, an elementary course in Cremona's Projective geometry, five hours.—By Dr. D. A. MURRAY: Differential equations, five hours; Descriptive astronomy, five hours.—By Dr. G. A. MILLER: Integral calculus, based on the treatises of Todhunter and Williamson, five hours; Introduction to the theory of groups and the theory of numbers, five hours; History of mathematics, five hours.—By Dr. J. V. WESTFALL: Theory of functions of a complex variable, the elements of the theories of Cauchy, Riemann, and Weierstrass, three hours.

HARVARD UNIVERSITY.—The following advanced mathematical courses are offered during the academic year 1901–1902:—By Professor J. M. PIERCE: Quaternions (first course); Triangular coordinates and algebraic plane curves, especially cubics; † Application of quaternions to the theory of curves and surfaces; † Selected topics in quaternions.—By Professors W. E. BYERLY and B. O. PEIRCE: Trigonometric series, spherical harmonics, and potential function.—By Professor W. E. BYERLY: Calculus (second course); Dynamics of a rigid body.—By Professor W. F. OSGOOD: † Infinite series and products; Theory of functions (first course).—By Professor M. BÔCHER: † Algebra, properties of polynomials, invariants; † Introduction to partial differential equations; Functions defined by linear differential equations.—By Dr. C. L. BOUTON: † Theory of numbers; † Elementary differential equations.—By Mr. J. K. WHITTEMORE: Modern geometry; Hydrostatics, hydrokinetics.—By Mr. J. L. COOLIDGE: † Theory of equations, invariants; Non-euclidean geometry.

These courses will involve three lectures a week throughout the year, except those preceded by †, which involve about half this number of lectures. Professors BYERLY and OSGOOD, Dr. BOUTON, and Mr. COOLIDGE also offer courses in reading and research on Picard's *Traité d'analyse*, Calculus of variations, Theory of continuous groups, and Projective geometry, respectively.

The mathematical conference will meet twice a month.

YALE UNIVERSITY.—The following courses in mathematics

are announced for the year 1901–1902 :—By Professor J. E. CLARK : † Determinants, with applications to geometry and the theory of elimination, two hours ; † Differential equations, two hours.—By Professor J. W. GIBBS ; † Vector analysis, three hours ; † Advanced vector analysis, three hours ; Electricity and magnetism, one hour ; Thermodynamics and properties of matter, two hours.—By Professor W. BEEBE : Celestial mechanics, three hours.—By Professor J. PIERPONT : † Higher algebra, three hours ; † Differential equations and function theory, three hours ; Theory of functions, three hours.—By Professor P. F. SMITH : Advanced differential geometry, two hours ; † Foundations of geometry, two hours.—By Professor H. A. BUMSTEAD : Problems in mathematical physics, two hours.—By Dr. M. B. PORTER : Advanced calculus, three hours ; † Selected topics in differential equations, three hours.—By Dr. W. A. GRANVILLE : † Differential geometry, three hours.—By Mr. E. B. WILSON : † Analytical mechanics, three hours ; † Projective geometry, three hours.

Courses preceded by † extend through only one half of the year.

THE several German universities below offer during the summer semester, 1901, courses in mathematics as follows :

UNIVERSITY OF BERLIN.—By Professor L. FUCHS : Applications of the theory of elliptic functions, three hours ; Theory of linear differential equations, four hours.—By Professor H. A. SCHWARZ : Integral calculus, four hours ; Theory of analytic functions, I, four hours ; Gauss's hypergeometric series, two hours ; Mathematical colloquium, two hours.—By Professor G. FROBENIUS : Theory of algebraic equations, II, four hours.—By Professor J. KNOBLAUCH : Theory of space curves, one hour ; Theory of curved surfaces, four hours ; Elliptic functions, four hours. By Professor K. HENSEL : Analytic geometry of plane and space, four hours ; Theory of probabilities, two hours ; Geometry of numbers and its application ; Colloquium, two hours.—By Professor R. HELMERT : Figure of the earth, one hour ; Map projection, one hour.—By Professor R. LEHMANN-FILHÉS : Differential Calculus, four hours, with exercises, one hour.—By Professor G. HETTNER : Fourier's series and integrals, two hours.

UNIVERSITY OF BONN.—By Professor L. HEFFTER : Infinitesimal calculus, four hours, with exercises, one hour ; Descriptive geometry, two hours, with exercises, three hours.—

By Professor R. LIPSCHITZ: Theory of numbers, four hours; Seminar, two hours.—By Professor H. KORTUM; Theory of algebraic equations, four hours; Seminar, two hours.

UNIVERSITY OF HALLE.—By Professor G. CANTOR: Theory of numbers, four hours; Definite integrals and differential equations, two hours; Seminar, two hours.—By Professor A. WANGERIN: Theory of potential and spherical harmonics, five hours; Seminar, two hours.—By Professor V. EBERHARD: Theory of Determinants, one hour: Plane analytic geometry, three hours.—By Dr. E. NEUMANN: Infinitesimal calculus, I, four hours, with exercises, one hour.

UNIVERSITY OF INNSBRUCK.—By Professor O. STOLZ: Theory of double integrals, two hours; Calculus of variations, one hour; Seminar on the foregoing subjects, one hour; Theory of functions of a complex variable according to Cauchy and Weierstrass (continued), with seminar, three hours.—By Professor W. WIRTINGER: Linear partial differential equations (continued), three hours; Euler's and the hypergeometric integrals, two hours; Seminar, two hours.—By Dr. K. ZINDLER: Descriptive geometry, four hours; Applications of calculus to geometry (continued), two hours.

UNIVERSITY OF VIENNA.—By Professor J. v. ESCHERICH: Calculus of variations, five hours; Mathematical statistics, three hours; Proseminar, one hour; Seminar, two hours.—By Professor L. GEGENBAUER: Theory of quadratic forms, two hours; Theory of numbers, II, three hours; Theory of probabilities, three hours; Proseminar, one hour; Seminar, two hours.—By Professor F. MERTENS: Elements of infinitesimal calculus for students of all faculties, II, five hours, with exercises, two hours; Proseminar, one hour; Seminar, two hours.—By Professor G. KOHN: Synthetic geometry (continued), four hours, with exercises, one hour.—By Dr. V. SERSAWY: Mathematics of insurance, two courses of three and four hours respectively.—By Dr. A. TAUBER: Analytic geometry of space, three hours; Mathematics of insurance, three hours, with exercises, two hours.—By Dr. E. BLASCHKE: Introduction to mathematical statistics.—By Dr. R. D. v. STERNECK: On the number of prime numbers between given limits, one hour.—By Dr. J. A. GMEINER: Quaternions. with applications to the motion of points, one hour.

A COURSE of six lectures on "British mathematicians of the nineteenth century" was delivered by Dr. ALEXANDER

MACFARLANE at Lehigh University, April 12-23. The life and work of the following mathematicians was presented: George Peacock (1791-1858), Augustus De Morgan (1806-1871), W. R. Hamilton (1805-1865), George Boole (1815-1864), Arthur Cayley (1821-1895), W. K. Clifford (1845-1879).

DR. J. C. FIELDS has recently given at the University of Toronto a course of lectures on "The quadrature of the circle."

PROFESSOR J. W. GIBBS, of Yale University, has been elected an honorary member of the London physical society.

PROFESSOR G. HUMBERT of the Ecole polytechnique has been elected a member of the section of geometry of the Paris academy of sciences to fill the vacancy caused by the death of HERMITE.

PROFESSOR ASAPH HALL, U. S. Navy, who for the last five years has been lecturer on celestial mechanics at Harvard University, has resigned his position there, and will spend the next year or two in European travel.

It is reported that the faculty of the University of Munich has nominated Professors D. HILBERT, A. BRILL, and A. VOSS to fill the vacancy caused by the resignation of Professor G. BAUER.

DR. E. A. ENGLER, professor of mathematics in Washington University, St. Louis, Mo., has been elected president of the Worcester Polytechnic Institute, to succeed Dr. T. C. MENDENHALL, who retires on account of ill-health.

AT Columbia University, Dr. JAMES MACLAY has been promoted to an associate professorship of mathematics, and Mr. J. C. PFISTER to an instructorship in mechanics. Dr. G. H. LING, of Wesleyan University, and Mr. WILLIAM FINDLAY, of the University of Chicago, have been appointed tutors in mathematics in Columbia University.

MR. H. W. KUHN, of Cornell University, has been appointed assistant professor of mathematics in Ohio State University.

DR. R. E. MORITZ, of the University of Nebraska, has received leave of absence and will spend a year in study in Germany.

PROFESSOR H. A. ROWLAND, Johns Hopkins University, died at Baltimore, April 16.

THE death is announced of DR. J. T. DUFFIELD, professor of mathematics in Princeton University since 1847.

THE deaths are also announced of M. T. MOUTARD, an eminent French mathematician and engineer and honorary examiner at the Ecole polytechnique; of Dr. P. M. POKROWSKI, professor of mathematics at Kiew; and of Dr. F. MELDE, professor of physics and director of the mathematical and physical institute of the University of Marburg.

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## NEW PUBLICATIONS.

### I. HIGHER MATHEMATICS.

- COLLINS (J. V.). An elementary exposition of Grassmann's Ausdehnungslehre, or theory of extension. Springfield, Mo., Dixon, 1901, 8vo. 2+46 pp. (Reprinted from the *American Mathematical Monthly*, Vols. 6 and 7.)
- KIEPERT (L.). Grundriss der Differential- und Integralrechnung. Teil I: Differentialrechnung. 9te Auflage des gleichnamigen Leitfadens von M. Stegemann. Hannover, Helwing, 1901. 8vo. 17 + 750 pp. Cloth. M. 12.00
- MANNING (H. P.). Non-euclidean geometry. Boston, Ginn, 1901. 12mo. 4 + 95 pp. Cloth. \$0.75
- MOLK (J.). See TANNERY (J.).
- NICHOLS (E. W.). Differential and integral calculus, with applications; for colleges, universities and technical schools. Boston, Heath, 1900. 12mo. 405 pp. Half-leather. \$2.00
- STEGEMANN (M.). See Kiepert (L.).
- TANNERY (J.) et MOLK (J.). Eléments de la théorie des fonctions elliptiques. (En 4 volumes.) Vol. 4: Calcul intégral, partie 2e, et applications. Fascicule I. Paris, Gauthier-Villars, 1900. 8vo. Pp. 1—164. Vol. 4 complete Fr. 9.00
- WIENER (H.). Die Einteilung der ebenen Kurven und Kegel dritter Ordnung in 13 Gattungen. Teil I: Die Konfiguration der neun Wendepunkte einer ebenen Kurve dritter Ordnung. Teil II: Der syzygetische Büschel von Kurven dritter Ordnung. Halle, Schilling, 1901. 8vo. 6 + 34 pp. (Mathematische Abhandlungen aus dem Verlage mathematischer Modelle von M. Schilling in Halle a. S.; neue Folge, No. 2.) M. 1.60

### II. ELEMENTARY MATHEMATICS.

- ALASIA (C.). La recente geometria del triangolo. Città di Castello, Lapi, 1900. 8vo. 16 + 339 pp. Fr. 3.00