

NOTES.

THE British association for the advancement of science will hold its next annual meeting at Bradford opening September 5th. Sir WILLIAM TURNER is president of the association and Dr. J. LARMOR is president of the mathematical section.

THE annual meeting of the German mathematical association will be held simultaneously with the seventy-second meeting of the German association of scientists and physicians at Aachen, September 17-22, 1900. It is requested that the announcements of all mathematical papers intended for presentation be sent in time to reach Professor A. GUTZMER, Wildstrasse 2, Jena, before the first of May. Professor D. HILBERT is president of the association for the present year.

FOR the regular meeting of the London mathematical society to be held March 8th, a paper by Mr. W. F. SHEPPARD "On the use of the curve of error as an auxiliary curve in statistics," was announced.

AT the meeting of the London royal society, held March 1st, Professor KARL PEARSON presented, under the title, "On the correlation of characters not quantitatively measurable," the eighth of his series of papers of mathematical contributions to the theory of evolution.

THE following papers were presented at the regular meeting of the Edinburgh mathematical society held March 9th : — "A note on change of coördinate axes," by Professor STEGGALL ; "The condition for multiple roots of the equation in λ , $(a-\lambda, b-\lambda, \dots)=0$," by Mr. C. TWEEDIE ; "The analytical representation of a potential function by means of cylindrical and spherical harmonics, with applications to Green's problem," by Mr. J. DOUGALL.

AT a meeting of the Royal Irish academy held at Dublin, January 22d, 1900, the Reverend W. R. WESTROPP ROBERTS

read a paper "On the reduction of the integral $\int \frac{\varphi(z) dz}{\psi(z) \sqrt{f(z)}}$

to a number of other integrals of the form $\int \frac{dz}{(z-n)\sqrt{f(z)}}$,

where $\varphi(z)$ and $\psi(z)$ are rational integral functions and $f(z)$ a polynomial of degree $2m$." At the meeting of this academy on February 12th, Professor CHARLES J. JOLY read

a paper on the place of the Ausdehnungslehre in the general associative algebra of the quaternion type.

Two mathematical papers were presented at the meeting of the Literary and philosophical society of Manchester, February 6th; both were by Mr. R. F. GWYTHER; they were entitled "On the conditions of propagation of a solitary wave" and "On the motion of the particles in certain cases of steady fluid motion."

THE Australasian association for the advancement of science met at Melbourne January 9th. The presidential address was delivered by Mr. R. L. J. ELLERY on "The beginnings and growth of astronomy in Australia"; and the presidential address of the mathematical section by Mr. G. H. KNIBBS on "The development of the atomic theory of matter." The next meeting of the association will be held at Hobart in January, 1902.

THE second part of Professor A. R. FORSYTH'S Theory of differential equations, consisting of volumes II. and III. of his treatise, and devoted to non-linear ordinary equations, has recently been issued by the Cambridge University Press.

PROFESSOR É. PICARD presented the first part of the second volume of his work "Sur la théorie des fonctions algébriques de deux variables" to the Paris academy of sciences, March 5, 1900. This volume, as was the first, is published with the collaboration of M. SIMART. The part just issued deals principally with geometry on an algebraic surface. The point of view is chiefly that of algebra and analytical geometry, as adopted by Noether and the Italian mathematicians, although the transcendental position taken in the first volume of the treatise has not been entirely abandoned and will be resumed in the second part of the second volume. This second part will be occupied with the completion of the theory of double integrals of the second species; and a study of particular surfaces, especially those associated with abelian, hyperfuchsian and hyperabelian functions, will terminate the volume.

THE following volumes are announced as either in preparation or under the press for Teubner's series of textbooks in the mathematical sciences: P. BACHMANN, Elementary theory of numbers; M. BÔCHER, The real solutions of ordinary linear differential equations of the second order; G. BRUNEL, Analysis situs; G. CASTELNUOVO and F. EN-

RIQUES, Theory of algebraic surfaces ; F. DINGELDEY, Conics and systems of conics ; F. DINGELDEY, Collection of problems for the application of the infinitesimal calculus ; F. ENRIQUES, Principles of geometry ; J. HARKNESS, Elliptic functions ; G. KOHN, Rational curves ; A. KRAZER, Theory of theta functions ; R. VON LILIENTHAL, Differential geometry ; G. LORIA, The theory and history of special algebraic and transcendental plane curves ; R. MEHMKE, Graphical and numerical methods of computing, including reckoning machines ; E. NETTO, Theory of combinations ; E. PASCAL, Theory and application of determinants ; S. PINCHERLE, Functional equations and functional operations ; A. PRINGSHEIM, Lectures on number theory and function theory (the elementary theory of infinite algorithms and the analytic functions of a complex variable, vol. I. theory of numbers, vol. II. theory of functions) ; C. SEGRE, Lectures on algebraic geometry, with especial references to spaces of many dimensions ; D. SELIWANOFF, Calculus of differences ; M. SIMON, Elementary geometry ; P. STÄCKEL, Differential geometry of higher manifoldnesses ; O. STAUDE, Surfaces of the second order and systems of such surfaces ; O. STOLZ and J. A. GMEINER, Theoretical arithmetic ; R. STURM, Theory of geometrical relations ; R. STURM, Cubic space curves ; K. TH. VAHLEN, History of the fundamental theorem of algebra ; K. TH. VAHLEN, History of Sturm's theorem ; A. VOSS, Representation and development of curved surfaces ; E. VON WEBER, Lectures on Pfaff's problem and the theory of partial differential equations of the first order ; A. WIMAN, Finite groups of linear transformations ; H. G. ZEUTHEN, The enumerative methods of geometry.

THE inaugural academic lecture of Professor OTTO HÖLDER, delivered on recently assuming a full professorship of pure mathematics at the University of Leipzig, is promised at an early date from the press of B. G. Teubner. The lecture was a semi-popular one, entitled "Anschauung und Denken in der Geometrie."

MESSRS. Carré and Naud, of Paris, announce that a monograph on Interpolation by Dr. C. A. LAISANT, and one on Elimination by Dr. H. LAURENT, are in preparation for the physico-mathematical section of *Scientia*, a series of monographs published with the object of presenting the recent discoveries, leading ideas, and notable advances in the evolution of science. The editorial board of the physico-mathematical part of this undertaking consists of Professors

Appell, Cornu, d'Arsonval, Haller, Lippmann, Moissan, Poincaré, and Potier.

DURING the summer semester 1900 the several universities mentioned below offer the following mathematical courses :

UNIVERSITY OF BERLIN.—By Professor H. A. SCHWARZ: Synthetic geometry, four hours ; Applications of the theory of elliptic functions, four hours ; Theory of analytic functions, two hours ; Colloquia and seminar.—By Professor R. LEHMANN-FILHÉS: Analytical geometry, four hours ; Theory of hypergeometric series, one hour.—By Professor J. KNOBLAUCH: Integral calculus, four hours ; Theory of partial differential equations, four hours ; Theory of elliptic functions, one hour.—By Professor E. R. HOPPE: Integral calculus, four hours ; Analytical mechanics, four hours ; Elementary questions of philosophy, two hours.—By Professor K. HENSEL: Differential calculus, four hours ; Theory of surfaces of second order, two hours ; Analytical mechanics, four hours.—By Professor G. FROBENIUS: Theory of numbers, four hours ; Seminar.—By Professor L. FUCHS: Introduction to the theory of functions, four hours ; Seminar.—By Professor G. HETTNER: Infinite series, products and continued fractions, two hours.

UNIVERSITY OF BONN.—By Professor L. HEFFTER: Theory of functions, four hours ; Theory of invariants, three hours ; Exercises in function theory, one hour.—By Professor H. KORTUM: Elements of infinitesimal calculus, four hours ; Theory of series, two hours ; Seminar, two hours.—By Professor R. LIPSCHITZ: Elementary mechanics, four hours ; Mathematical seminar, two hours.

UNIVERSITY OF Breslau.—By Professor J. ROSANES: Analytical geometry of the plane, four hours ; Elements of theory of invariants, two hours ; Seminar, one hour.—By Professor R. STURM: Differential geometry, three hours ; Curves and surfaces of the third order, three hours ; Seminar, two hours.—By Professor F. LONDON: Introduction to the theory of elliptic functions, four hours.

UNIVERSITY OF GIESSEN.—By Professor M. PASCH: Plane analytical geometry, four hours ; Elliptic functions, four hours ; Seminar, one hour.—By Professor E. NETTO: Elements of algebra, four hours ; Definite integrals, two hours ; Seminar, one hour.—By Professor R. HAUSSNER: Theory of invariants and forms, two hours ; Solution of numerical equations, one hour ; Descriptive geometry, five hours.

UNIVERSITY OF GREIFSWALD.—By Professor W. THOMÉ : Analytical geometry, two hours ; Applications of the infinitesimal calculus to geometry, two hours ; Seminar, two hours.—By Professor E. STUDY : Theory of functions, four hours ; Infinitesimal calculus, four hours ; Seminar, one hour.

UNIVERSITY OF HALLE-WITTENBERG.—By Professor G. CANTOR : The Galois theory of the solution of algebraic equations, four hours ; Seminar, two hours.—By Professor A. WANGERIN : Differential calculus, five hours ; Elliptic functions, five hours ; Seminar, two hours.—By Professor V. EBERHARD : History of analysis, one hour ; Theory of functions, four hours.—By Dr. GRASSMANN : Analytical mechanics, two hours ; Descriptive geometry, two hours.—By Dr. NEUMANN : Selected chapters of analytical geometry, two hours ; Synthetic geometry of conic sections, two hours.

UNIVERSITY OF JENA.—By Professor J. THOMÆ : Elliptic functions, four hours ; Projective geometry, four hours.—By Professor G. FREGE : Analytical geometry, four hours ; Mathematical exercises, two hours ; Fundamental notions of mathematics, one hour.—By Professor A. GUTZMER : Differential calculus, four hours ; Exercises in the preceding, one hour ; Introduction to higher algebra, four hours.

UNIVERSITY OF KÖNIGSBERG.—By Professor F. MEYER : Introduction to higher geometry, four hours ; Seminar, one and a half hours.—By Professor A. SCHOENFLIES : Differential calculus, four hours ; Seminar, one and a half hours.—By Professor L. SAALSCHÜTZ : Fourier's series, two hours ; Bernoulli functions, three hours ; Exercises in Bernoulli numbers and functions, one hour.—By Dr. T. VAHLEN : Theory of linear differential equations, three hours.—By Dr. MÜLLER : Plane analytical geometry and exercises, four hours ; Graphical statics, two hours.

UNIVERSITY OF LEIPZIG.—By Professors W. SCHEIBNER and A. MAYER : no courses are offered during the summer semester.—By Professor C. NEUMANN : Theory of curved surfaces, four hours ; Seminar, one hour.—By Professor O. HÖLDER : Elliptic functions, four hours ; Calculus of variations, two hours ; Seminar, one hour.—By Professor F. ENGEL : Ordinary differential equations, four hours ; Theory of continuous groups, two hours ; Analytical mechanics, one hour ; Seminar, one hour.—By Dr. F. HAUSDORFF : Introduction to higher analysis, four hours ; Insurance mathematics, three hours.—By Dr. G. KOWALEWSKI : Analytical

geometry of plane and space, with exercises, five hours ; The quadrature of the circle, two hours.—By Dr. H. LIEB-MANN : Synthetic geometry, three hours ; Graphical statics, one hour ; Definite integrals, two hours.

UNIVERSITY OF MARBURG.—By Professor F. SCHOTTKY : Curvature of lines and surfaces, four hours ; Theory of representation, three hours ; Seminar, two hours.—By Professor A. E. HESS : Differential calculus, five hours ; Foundations of modern geometry, two hours ; Seminar, two hours.—By Dr. F. VON DALWIGK : Definite integrals, three hours ; Descriptive geometry, six hours.

UNIVERSITY OF STRASSBURG.—By Professor T. REYE : Synthetic geometry, two hours ; Technical mechanics, four hours ; Seminar, one hour.—By Professor H. WEBER : Theory of functions, four hours ; Hydrodynamics, two hours ; Seminar, two hours.—By Professor G. ROTH : Infinitesimal calculus, three hours ; Plane analytical geometry, two hours.—By Professor A. KRAZER : Definite integrals, three hours ; Graphical statics, two hours ; Determinants, two hours.—By Dr. E. TIMERDING : Theory of algebraic curves, two hours.—By Dr. J. WELLSTEIN : Algebraic equations, three hours.

UNIVERSITY OF WÜRZBURG.—By Professor F. PRYM : Integral calculus, six hours ; Exercises on the preceding, two hours ; Selected chapters of function theory, two hours.—By Professor A. VOSS : Analytical and synthetical geometry of conics, four hours ; Analytical geometry of space, four hours ; Selected chapters of higher mathematics, two hours.

At the University of Göttingen, from April 19th to May 1st, there is to be given a series of special lectures in mathematics and physics intended as an Easter vacation course for teachers in the high schools of Germany. The lectures in mathematics include lectures by Professor F. KLEIN, on the teaching of applied and technical mechanics in the schools ; by Professor G. BOHLMANN, on the elements of the mathematics of life insurance ; and by Professor F. SCHILLING, on descriptive geometry.

MESSRS. Macmillan and Bowes, 1 Trinity Street, Cambridge, England, have issued a new list of second-hand mathematical books, under date of February, 1900.

THREE letters written by DE MORGAN to SYLVESTER in

1856, when the latter was professor of mathematics at the Woolwich military academy, appear in the January number of the *Monist*, with an introduction by Professor G. B. HALSTED, of the University of Texas.

THE University of Oxford has recently instituted the degrees of doctor of letters and doctor of science as advanced research degrees.

THE London mathematical society has passed a resolution permitting the increase of the number of its members by further elections to three hundred and fifty. The previous limitation was two hundred and fifty.

PROFESSOR G. G. STOKES, of Cambridge University, has been elected a foreign associate of the Paris academy of sciences.

At the University of Cambridge, the Hopkins prize for the period 1891-94 has been awarded to Mr. W. D. NIVEN, F.R. S., for his memoir on ellipsoidal harmonics, published in the *Philosophical Transactions* for 1891; Mr. NIVEN was formerly a fellow of Trinity College.

AMONG the foreign correspondents elected by the Berlin academy of sciences at the recent celebration of the two hundredth anniversary of its organization, are Professor J. WILLARD GIBBS, of Yale University, and Professor H. A. ROWLAND, of Johns Hopkins University.

THE Royal Irish Academy has elected Professor P. G. TAIT, of Edinburgh, and Professor J. J. THOMSON, of Cambridge, to honorary membership.

LORD KELVIN has been elected a foreign member of the Berlin academy of sciences.

DR. MAX ABRAHAM has been admitted as Privatdocent at the University of Göttingen. In the coming summer semester he will give a course on the electromagnetic theory of light.

DR. HARRIS HANCOCK, instructor in mathematics at the University of Chicago, has been elected professor of mathematics at the University of Cincinnati.

DR. G. W. MYERS, professor of astronomy in the University of Illinois, has resigned to take charge of the department of mathematics and astronomy in Chicago Institute.

PROFESSOR R. L. MORSE, of Hanover College, has been made professor emeritus of mathematics, after twenty-five years of service in that institution; the active professorship thus made vacant has been filled by the election of Dr. R. S. LAWRENCE, of Emporia College.

PROFESSOR H. WEBER has been elected rector of the University of Strassburg.

THE honorary degree of doctor of laws has been conferred on Professor A. R. FORSYTH by Glasgow University.

A STATUE of Professor CHARLES HACKLEY has been recently presented to Columbia University. Professor Hackley held the chair of mathematics in Columbia College from 1843-1861.

PROFESSOR E. BELTRAMI died at Rome, February 18, 1900.

PROFESSOR JOSEPH L. F. BERTRAND, of Paris, died recently at the age of seventy-eight years.

THE deaths are also announced of Miss CATHERINE WOLFE BRUCE, the well known patron of astronomical science; of Professor THOMAS PRESTON, fellow of the Royal University of Ireland; and of Mr. J. J. WALKER, one of the early members of the London Mathematical Society which he had served both as president and vice-president.

NEW PUBLICATIONS.

I. HIGHER MATHEMATICS.

BOLTZMANN (L.). See CLARK UNIVERSITY.

BOREL (E.). *Nouvelles leçons sur la théorie des fonctions. Leçons sur les fonctions entières.* Paris, Gauthier-Villars, 1900. 8vo. 6 + 126 pp.

BRANDENBURGER (C.). *Anwendung der elliptischen Funktionen auf durch algebraische Funktionen vermittelte konforme Abbildungen.* (Diss.) Zürich, 1899. 8vo. 49 pp., 4 plates.

BRAUN (J.). *Das Fortschrittgsgesetz der Primzahlen durch eine transcendente Gleichung exakt dargestellt.* (Progr.) Trier, 1899. 8vo. 34 pp., 6 tables.