

ter XIV deals with the transformation of series. Applications are made to the evaluation of definite integrals and to the numerical calculation of slowly converging series by means of their transformation into series which are more rapidly convergent.

There are many references to the literature of the subject. No one interested in the calculus of finite differences can afford to be without Professor Markoff's valuable treatise.

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NOTES.

At the meeting of the London Mathematical Society, held January 12th, the following papers were communicated: Linear transformation by inversion, by Dr. G. G. MORRICE; The zeros of the Bessel functions (second paper), by Mr. H. M. MACDONALD; A simple method of factorizing large composite numbers of any unknown form, by Mr. D. BIDDLE; On a determinant each of whose elements is the product of k factors, by Professor W. H. METZLER; Properties of hyperspace, in relation to systems of forces, the kinematics of rigid bodies, and Clifford's parallels, by Mr. A. N. WHITEHEAD; On the reduction of a linear substitution to its canonical form, by Professor W. S. BURNSIDE.

THE anniversary meeting of the Royal Astronomical Society was held February 10th. The retiring president, Professor R. S. BALL, delivered the address on presentation of the gold medal which had been awarded to Mr. F. McCLEAN. The president for the coming year is Professor G. H. DARWIN, and the honorary secretaries are Messrs. F. W. DYSON and F. NEWALL.

THE committee of organization of the international congress of mathematicians to be held in Paris from August 6th to 12th, 1900, has issued a preliminary circular requesting every one interested to notify the committee, whose headquarters are at 7 rue des Grands-Augustins, Paris, as to the probability of his attending or that of his not attending the congress. It is further requested that this intelligence be sent at once and that it specify the number of

members of one's family who may accompany him. The programme of the congress will include at least two general sessions, daily sectional meetings in the morning, scientific excursions, and a concluding banquet. Tickets of admission to the congress will cost thirty francs. The ticket entitles the holder to admission to all the meetings, to participation in the excursions and banquet, to reduced rates of admission for members of his own family, and to a copy of the published proceedings of the congress. The committee of organization cannot undertake to look after the material welfare of those in attendance at the congress, but proposes to issue later a circular of information relative to hotel accommodations and reduced rates of transportation that may be available on the occasion of the universal exposition.

THE officers of the international association for promoting the study of quaternions and allied systems of mathematics for the years 1899 and 1900 are as follows: Professor R. S. BALL, Cambridge, England, president; Dr. A. MACFARLANE, South Bethlehem, Pennsylvania, general secretary and treasurer; Professor A. MCAULAY, Hobart, Australia, secretary for Australasia; Professor PAUL GENTY, Paris, secretary for France; Professor V. SCHLEGEL, Hagen in Westphalia, secretary for Germany; Professor CHARLES J. JOLY, Dublin, secretary for Great Britain and Ireland; Professor G. PEANO, Turin, secretary for Italy; Dr. S. KIMURA, Tokio, secretary for Japan; Mr. A. P. KOTELNIKOF, Kasan, secretary for Russia; Dr. F. KRAFT, Zürich, secretary for Switzerland; Professor A. S. HATHAWAY, Terre Haute, Indiana, secretary for the United States.

THE *Annals of Mathematics*, published for the past fifteen years at the University of Virginia, is to be transferred to Harvard University with the close of the present volume. The policy and editorial supervision of the journal under its new management have not yet been announced.

THE new international review, *L'Enseignement Mathématique*, projected recently under the editorial direction of Professors C. A. LAISANT and H. FEHR, will be edited with the coöperation of a committee of patronage consisting of Professors P. Appell, of Paris; N. Bougaiev, of Moscow; M. Cantor, of Heidelberg; L. Cremona, of Rome; E. Czuber, of Vienna; Z. G. de Galdeano, of Saragossa; A. G. Greenhill, of Woolwich; F. Klein, of Göttingen; V. Liguine, of Warsaw; P. Mansion, of Gand; Mittag-Leffler, of Stockholm; G. Oltramare, of Geneva; J. Petersen, of

Copenhagen ; É. Picard, H. Poincaré, of Paris ; P. H. Schoute, of Groningen ; C. Stephanos, of Athens ; F. G. Teixeira, of Oporto ; A. Vassilieff, of Kasan ; A. Ziwet, of Ann Arbor.

The mathematical seminars of the universities of Göttingen and Tübingen have issued programmes of study, with special reference to directing students in making the best use of the lectures, library, and laboratory facilities available for the prosecution of the mathematical sciences in these institutions. These programmes will prove especially valuable to foreign students contemplating a course of study in a German university.

THE collection of twelve kinematical models whose construction was undertaken by Professor FR. SCHILLING, of Karlsruhe, under the encouragement accorded by the German Mathematical Association at its Frankfort meeting in 1896, has recently been finished. Duplicates of this collection are offered for sale, at the price of four hundred and sixty-eight marks for the complete set, by Messrs. Schroedel and Simon, of Halle, who will take pleasure in sending photographs of the models on request from intending purchasers.

Two recent catalogues of mathematical works, new and second hand, have been received from Leipzig : Catalogue number 539 of K. F. Koehler's antiquarium, and catalogue number 1018 of Kirchhoff and Wigand. The former of these is constructed largely from the libraries of the late Professors E. SCHERING, of Göttingen, and J. A. BECKER, of Zwickau.

MESSRS. Henry Holt and Company announce for immediate publication an Elementary Algebra by GEORGE W. EVANS, of the English High School, Boston. At each turn of the subject the departure is made from problems and the book contains an unusually large collection of new exercises.

THE Elements of Practical Astronomy by W. W. CAMPBELL, Astronomer at the Lick Observatory, will be published shortly by The Macmillan Company in a second, revised and enlarged, edition.

MESSRS. Mayer and Müller, of Berlin, announce that the printing of the fourth volume of the collected works of

KARL WEIERSTRASS will be finished during the present year. This volume is to contain the lectures on the theory of abelian transcendents.

A COMPLETE biography of the Polish philosopher, H. WRONSKI, is in preparation by Mr. ZENON PRZESMYCKI.

COLLÈGE DE FRANCE. The programme of lectures for the first semester of 1898-99 includes the following courses in the mathematical sciences, each course consisting of two lectures per week throughout the semester :—By Professor HADAMARD, Mechanics of fluids.—By Professor JORDAN, Elliptic functions.—By Professor DEPREZ, Electricity and magnetism, and the measurement of electrical magnitudes.—By Professor BRILLOUIN, General properties of fluids.

UNIVERSITY OF HEIDELBERG. The following courses in mathematics are announced for the summer semester of 1899 :—By Professor KOENIGSBERGER : Differential and integral calculus, four hours ; Theory of functions, four hours ; Mathematical seminar, two hours.—By Professor VALENTINER : General astronomy, three hours ; Theory of eclipses, two hours.—By Professor CANTOR : Definite integrals between real limits, four hours ; Arithmetic and algebra, three hours.—By Professor F. EISENLOHR : Theory of probability, three hours ; Mechanics, four hours.—By Professor KOELLER : Plane analytical geometry, three hours.—By Professor LANDSBERG : Theory of determinants, two hours ; Theory of potential, two hours.

UNIVERSITY OF MUNICH. The courses in mathematics offered for the summer semester of 1899 are as follows :—By Professor BAUER : Algebra, second part ; Mathematical seminar in subjects of algebra.—By Professor LINDEMANN : Theory of elliptic functions ; Theory of algebraic forms ; Seminar.—By Professor SEELIGER : Theory of the form of the heavenly bodies.—By Professor PRINGSHEIM : Integral calculus ; Exercises in integral calculus.—By Professor GRAETZ : Mechanical theory of heat ; Higher mechanics.—By Dr. BRUNN : Elements of higher mathematics for general students.—By Dr. DÖHLEMANN : Descriptive geometry ; Exercises on the preceding course ; Kinematics ; Exercises in kinematics.—By Dr. ANDING : Theory of absolute perturbations ; Elements of astronomy.—By Dr. v. WEBER : Determinants with applications ; Elementary geometry.—By Dr. KORN : Analytical mechanics ; Theory of capillarity.

UNIVERSITY OF TÜBINGEN. The announcements of lectures for the summer semester of 1899 include the following courses in mathematical subjects :—By Professor STAHL : Elementary analysis, three hours ; Higher analysis, three hours ; Mathematical seminar, two hours.—By Professor v. BRILL : Solid analytical geometry, three hours ; Theory of curvature of surfaces, four hours ; Seminar, two hours.—By Professor MAURER : Descriptive geometry, two hours ; Exercises accompanying this course, two hours ; Synthetic geometry, two hours ; Exercises in synthetic geometry, one hour.—By Professor WAITZ : Theory of electricity and magnetism, three hours ; Exercises in the theory of electricity, two hours.

UNIVERSITY OF WÜRZBURG. The following mathematical courses are offered for the summer semester of 1899 :—Professor PRYM : Integral calculus, six hours ; Seminar in integral calculus, two hours ; Seminar in theory of functions, two hours.—By Professor VOSS : Analytic mechanics, three hours ; Analytic and synthetic geometry of conics, four hours ; Introduction to the theory of plane curves, three hours.—By Professor SELLING : Spherical astronomy, two hours.—By Dr. WIEN : Electrostatics and electrodynamics, two hours.

AUGUSTUS E. H. LOVE, F.R.S., has been appointed to the vacant Sedleian professorship at Oxford. Mr. Love, of St. John's College, Cambridge, was second wrangler in 1885, and obtained the first Smith's prize in 1886. He has written many memoirs, chiefly on applied mathematics, and is the author of well known treatises on elasticity and dynamics.

PROFESSOR H. POINCARÉ has been nominated president of the French Bureau des Longitudes.

THE title of Professor R. S. WOODWARD of Columbia University has been changed from professor of mechanics to professor of mechanics and mathematical physics.

DR. THOMAS J. J. SEE has been nominated for a professorship of mathematics in the United States Navy.

PROFESSOR A. SCHOENFLIES, of the University of Göttingen, has been called to a professorship in mathematics in the University of Königsberg.

MR. R. C. MACLAURIN, Fellow of St. John's College, Cambridge, has been made professor of mathematics in Victoria College, New Zealand.

PROFESSOR SOPHUS LIE, of the University of Christiania, died on February 18.

NEW PUBLICATIONS.

I. HIGHER MATHEMATICS.

- ALASIA (A.). Sulle involuzioni di ordini superiori. Civitanova, Marche, 1898. 8vo. 38 pp. Fr. 2.00
- ALASIA (C.). Esercizi ed applicazioni di calcolo infinitesimale ed integrale. Città di Castello, Lapi, 1898. 8vo. 232 pp. Fr. 5.00
- ALLAN (C.). Formulario di matematica e fisica. Parte I (aritmetica, algebra, geometria piana, geometria solida, trigonometria piana, trigonometria sferica, geometria analitica a due e a tre dimensioni, calcolo differenziale, calcolo integrale, applicazioni del calcolo differenziale e integrale). Pavia, Fusi, 1898. 8vo. 17 and 207 pp. Fr. 3.00
- ANNALEN, MATHEMATISCHE. Generalregister zu den Bänden 1-50, zusammengestellt von A. Sommerfeld. Leipzig, Teubner, 1898. 8vo. 11 and 202 pp., with portrait of Clebsch. M. 7.00
- BIDDLE (D.). See QUESTIONS AND SOLUTIONS.
- BIESE (A. C.). Geometrische Untersuchung über die Wurzeln einer Gleichung von der form $f(x) = ax + b$. Berlin, 1898. 8vo. M. 2.00
- CAUCHY (A.). Oeuvres complètes d'Augustin Cauchy. Publiées sous la direction scientifique de l'Académie des sciences et sous les auspices de M. le ministre de l'instruction publique. Première série. Tome XI. Paris, Gauthier-Villars, 1899. 4to. 462 pp. Fr. 25.00
- DOLANSKI (H.). Zwei Probleme: Dreitheilung des Winkels und Quadratur des Kreises. Reval, Kluge, 1898. 8vo. 27 pp., with table. M. 4.00
- EMMERICH. See HOFFMANN (J. C. V.).
- GULDBERG (A.). Sur la théorie des congruences différentielles linéaires. Christiania, Dybwad, 1898.
- HOCH (J.). Katechismus der Projectionslehre. Mit einem Anhang: Die Elemente der Perspective. Zweite Auflage. Leipzig, 1898. 8vo. 8 and 153 pp., with 121 wood cuts. Cloth. M. 2.00
- HOFFMANN (J. C. V.). Sammlung der Aufgaben des Aufgaben-Reperatoriums der ersten 25 Bände der Zeitschrift für mathematischen und naturwissenschaftlichen Unterricht. Herausgegeben unter Mitwirkung von Stoll, systematisch geordnet von Emmerich und C. Müsebeck. Leipzig, Teubner, 1898. 8vo. 12 and 399 pp. Cloth. M. 6.00
- LANNER (A.). See PEANO (G.).