

NOTES.

THE tenth regular meeting of the Chicago Section of the AMERICAN MATHEMATICAL SOCIETY will be held at Northwestern University, Evanston, Ill., on Friday and Saturday, December 27–28 next. Titles and abstracts of papers to be read at this meeting should be in the hands of the Secretary of the Section not later than December 5.

AMONG the officers of the American association for the advancement of science elected at the Denver meeting are : president of the association, Professor ASAPH HALL, U. S. Navy, retired ; president of Section A (mathematics and astronomy), Professor G. W. HOUGH, of Northwestern University ; secretary of Section A, Professor E. S. CRAWLEY, of the University of Pennsylvania. The next summer meeting of the Association will be held at Pittsburg, Pa., June 28 to July 3, 1902.

AT a meeting of the Liverpool Mathematical Society held in University College on Wednesday, June 26, 1901, Professor F. S. CAREY in the chair, Professor SEBASTIAN SIRCOM was unanimously elected president for the ensuing year, Professor CAREY, the retiring president, becoming vice-president. A paper on “Möbius’ barycentric calculus and Grassmann’s calculus of extension” was read by Professor R. A. SAMPSON, who explained the two methods and showed the connection between them. Professor L. R. WILBERFORCE exhibited some apparatus, using his springs showing the transformation of longitudinal into rotational oscillation, and vice versa. He also exhibited and explained the principal oscillations of the apparatus.

THE annual meeting of the German mathematical society was held at Hamburg, September 22–28. The preliminary programme of papers to be presented is as follows : V. EBERHARD, Halle : “Contribution to the theory of equations” ; W. EBERT, Kiel : “On a question in celestial mechanics” ; F. ENGEL, Leipsic : “Higher differential quotients” ; F. FOLIE, Grivegnée : “On Oppolzer’s formulæ for nutation” ; D. HILBERT, Göttingen : “On certain recent mathematical dissertations” ; J. KOWALEWSKY, Leipsic : “Report on the theories of Sophus Lie” ; R. v. LILIENTHAL, Münster : “The geometry of motion in its application to differential geometry” ; A. MARCUSE, Berlin : “Recent developments in the determination of geographical positions” ; F. KLEIN, Göttingen, F. MEYER, Koenigsberg, and E. WIECH-

ERT, Göttingen : " An account of the present condition of the Encyclopædia of the mathematical sciences " ; F. SCHILLING, Göttingen : " New kinematical models in tooth gear and their relation to the theory of contact transformations ; P. SCHOUTE, Groningen : " On the mobility of a nullsystem N_{n-1} in R_n " ; H. SCHUBERT, Hamburg : " On the number of constants of the n -dimensional generalization of polyedra ;" P. STÄCKEL, Kiel : " Report on the development of instruction in applied mathematics in the German universities " ; E. STUDY, Greifswald : " A new branch of geometry " ; ADLER, Prague : " Spherical representation of surfaces and its application in descriptive geometry " ; C. CHARLIER, Lund : " The astronomical explanation of an ice age " ; HALM, Edinburgh : " The relations of terrestrial magnetism to seismological events and their significance for practical and theoretical astronomy " ; F. MEYER, Königsberg : " The extension of the theorems of Henrici and Ivory to surfaces of any order " ; TORKA, Berlin : " On a new geometry of motion " ; E. ZERMELO, Göttingen : " On a maximum problem in geometry," " On the theory of the shortest lines."

THE several universities below offer during the winter semester 1901-1902 courses in mathematics as follows :

UNIVERSITY OF BERLIN.—By Professor L. FUCHS : Hyperelliptic functions, three hours ; Theory of functions, three hours ; Seminar, three hours.—By Professor H. A. SCHWARZ : Analytical geometry, four hours ; Conic sections, two hours ; Theory of analytical functions, four hours ; Colloquium, two hours ; Seminar, two hours.—By Professor J. KNOBLAUCH : Differential calculus, four hours ; Applications of elliptic functions, four hours ; Exercises in differential calculus, one hour.—By Professor R. LEHMANN-FILHÉS : Integral calculus, four hours, with exercises, one hour.—By Professor G. FROBENIUS : Theory of determinants, four hours ; Theory of numbers, four hours ; seminar, three hours.—By Professor K. HENSEL : Applications of elliptic functions to algebra and the theory of numbers, three hours ; Mechanics, four hours ; Colloquium, one hour.—By Dr. E. LANDAU : Algebra, four hours ; Theory of transcendental functions, one hour.

UNIVERSITY OF BONN.—By Professor L. HEFFTER : Infinitesimal calculus, II., four hours, with exercises, one hour ; Theory of curves and surfaces, four hours, with exercises, one hour.—By Professor H. KORTUM : Analytical geometry, five hours ; Determinants, two hours ; Seminar, two hours.

—By Professor R. LIPSCHITZ : Partial differential equations of physics, four hours ; seminar, two hours.

UNIVERSITY OF BRESLAU.—By Professor J. ROSANES : Analytical geometry of space, three hours ; Elements of the theory of functions, three hours ; Seminar, one hour.—By Professor R. STURM : Theory of geometrical relations, II., two hours ; Differential geometry, three hours ; Seminar, two hours.—By Dr. F. LONDON : Infinitesimal calculus, four hours, with exercises, one hour.

UNIVERSITY OF ERLANGEN.—By Professor P. GORDAN : Infinitesimal calculus, four hours ; Theory of numbers, four hours ; Seminar, three hours.—By Professor M. NÖTHER : Analytical geometry, four hours ; Analytical mechanics, four hours ; Seminar.

UNIVERSITY OF FREIBURG.—By Professor J. LÜROTH : Analytical geometry and differential calculus, five hours ; Seminar.—By Professor L. STICKELBERGER : Algebraic analysis, three hours ; Elliptic functions, four hours.—By Dr. A. LOEWY : Differential equations, three hours ; Political arithmetic, three hours.—By Dr. E. REBMANN : Elements of descriptive geometry with exercises, three hours.

UNIVERSITY OF GIESSEN.—By Professor M. PASCH : Plane analytical geometry, II., three hours and a half ; Calculus of variations, two hours ; Seminar, one hour.—By Professor E. NETTO : Infinitesimal calculus, three hours ; Analytical mechanics, three hours ; Theory of functions, continuation, two hours ; Seminar, one hour.—By Professor R. HAUSSNER : Theory of numbers, four hours ; Descriptive geometry, with exercises, four hours and a half ; Exercises in higher mathematics, one hour and a half.

UNIVERSITY OF GÖTTINGEN.—By Professor F. KLEIN : Mechanics of particles and rigid systems, four hours ; Seminar, two hours.—By Professor D. HILBERT : Potential, four hours ; Number concept and quadrature of circle, two hours ; Exercises in the theory of functions in seminar, two hours.—By Professor M. BRENDL : Geodesy, two hours ; Introduction to computation of perturbations, two hours ; Elements of infinitesimal calculus, two hours.—By Professor F. SCHILLING : Descriptive geometry, four hours, with exercises, four hours ; Kinematics, one hour.—By Professor K. BOHLMANN : Mathematics of insurance, three hours, with exercises in seminar, two hours.—By Dr. E. ZERMELO : Theory of numbers, four hours.—By Dr. J. SOMMER : Integral calculus, four hours.

UNIVERSITY OF GREIFSWALD.—By Professor W. THOMÉ : Theory of analytical functions, in particular elliptic functions, I., four hours ; Infinitesimal calculus, I., four hours ; Seminar, two hours.—By Professor E. STUDY : Analytical geometry, II., four hours ; Differential equations, three hours ; Seminar, one hour.

UNIVERSITY OF HALLE-WITTENBERG.—By Professor G. CANTOR : Theory of elliptic functions, two hours ; Seminar, one hour.—By Professor A. WANGERIN : Analytical mechanics, four hours ; Synthetic geometry, four hours, with exercises, one hour ; Seminar, one hour.—By Professor V. EBERHARD : Analytical geometry of space, three hours, with exercises, one hour.—By Dr. H. GRASSMANN : Selected chapters of technical mechanics, two hours ; Conformal representation, two hours, with exercises, one hour fortnightly.—By Dr. E. NEUMANN : Infinitesimal calculus, II., with exercises, four hours.

UNIVERSITY OF HEIDELBERG.—By Professor L. KOENIGSBERGER : Analytical mechanics, four hours ; Selected chapters of integral calculus (calculus of variations, differential equations), two hours ; Elliptic functions, two hours ; Seminar, two hours.—By Professor H. VALENTINER : Theory of orbits, three hours.—By Professor M. CANTOR : Infinitesimal calculus, four hours, with exercises, one hour ; Political arithmetic, two hours.—By Professor F. EISENLOHR : Optics, four hours ; Infinitesimal calculus, five hours ; Potential, two hours.—By Professor K. KOEHLER : Analytical geometry of space, three hours.—By Professor G. LANDSBERG : Descriptive geometry, with exercises, four hours.—By Dr. K. BOEHM : Partial differential equations, two hours ; Abel's memoir on binomial series, one hour.

UNIVERSITY OF INNSBRUCK.—By Professor O. STOLZ : Analysis of real numbers, five hours ; Seminar, two hours.—By Professor W. WIRTINGER : Algebraic functions and their integrals, five hours ; Seminar, two hours.—By Dr. K. ZINDLER : Differential equations, three hours ; Introduction to continuous groups, two hours.

UNIVERSITY OF JENA.—By Professor J. THOMAE : Analytical geometry of space, four hours ; Elementary theory of functions, four hours ; Seminar, two hours.—By Professor A. GUTZMER : Theory and applications of determinants, three hours ; Integral calculus, four hours, with exercises, one hour.—By Professor J. FREGE : Theory of numbers, four hours.

UNIVERSITY OF KIEL.—By Professor L. POCHHAMMER : Plane analytical geometry, three hours ; Differential equations with one independent variable, three hours ; Seminar, one hour.—By Professor P. STAECKEL : Integral calculus with introduction to theory of differential equations, four hours ; Abelian functions, four hours ; Non-euclidean geometry, one hour ; seminar, one hour.

UNIVERSITY OF KOENIGSBERG.—By Professor F. MEYER : Modern geometry of the triangle, one hour ; Introduction to the theory of differential equations, four hours ; Seminar, one hour.—By Professor A. SCHOENFLIES : Theory of functions, five hours ; General introduction to higher mathematics, two hours ; Seminar, two hours.—By Professor L. SAALSCHÜTZ : Differential calculus, two hours ; Integral calculus, four hours, with exercises, one hour.—By Dr. E. MÜLLER : Descriptive geometry, four hours ; Introduction to Grassmann's Ausdehnungslehre, two hours.

UNIVERSITY OF LEIPSIK.—Professor SCHEIBNER offers no courses this semester, and those of Professor Mayer will be announced later.—By Professor C. NEUMANN : Theory of potential and spherical harmonics, four hours ; Seminar, two hours.—By Professor O. HÖLDER : Mechanics, four hours ; Galois' theory of equations, two hours ; Seminar, one hour. By Professor F. ENGEL : Infinitesimal calculus, four hours ; Differential invariants and theory of groups, one hour ; Seminar, one hour ; Exercises in differential invariants and theory of groups, with Dr. Kowalewski, one hour.—By Dr. F. HAUSDORFF : Projective geometry treated synthetically, four hours ; Non-euclidian geometry, two hours.—By Dr. G. KOWALEWSKI : Theory of functions, four hours, with exercises, one hour ; Introduction to theory of transformation groups, two hours, with exercises, one hour.—By Dr. H. LIEBMANN : Analytical geometry of space, two hours, with exercises, one hour ; Theory and application of determinants, two hours.

UNIVERSITY OF MARBURG.—By Professor F. SCHOTTKY : Integral calculus, four hours ; Theory of numbers, four hours ; Seminar, two hours.—By Professor E. HESS : Geometry of space considered analytically and synthetically, four hours ; Theory of algebraic equations and determinants, four hours ; Seminar, three hours.—By Dr. F. v. DALGWICK : Applications of infinitesimal calculus, three hours ; Kinematics, one hour.

UNIVERSITY OF MUNICH.—By Professor G. BAUER : Plane analytical geometry ; Seminar.—By Professor F. LINDEMANN : Differential calculus ; Analytical mechanics ; Line and sphere geometry ; Seminar.—By Professor A. PRINGSHEIM : Elementary theory of infinite series, products, and continued fractions : Introduction to the theory of analytical functions.—By Dr. K. DÖHLEMANN : Descriptive geometry, with exercises ; Synthetic geometry, with exercises.—By Dr. E. VON WEBER : Introduction to analysis ; Differential equations.—By Dr. J. GÖTTLER : Algebra, with exercises.

UNIVERSITY OF STRASSBURG.—By Professor T. REYE : Geometry of space, modern methods, two hours ; Mathematical theory of elasticity, two hours.—By Professor H. WEBER : Theory of numbers, four hours ; Infinite series, two hours ; Seminar in conjunction with Dr. Wellstein.—By Professor F. ROTH : Algebraic analysis and determinants, three hours ; Analytical geometry of space, two hours ; Ordinary differential equations, two hours.—By Professor A. KRAZER : Infinitesimal calculus, four hours ; Plane analytical geometry, four hours : Seminar, two hours.—By Dr. E. TIMERDING : Theory of surfaces, two hours.—By Dr. J. WELLSTEIN : Graphical statics, two hours, with exercises, two hours.

UNIVERSITY OF TÜBINGEN.—By Professor A. VON BRILL : Introduction to higher mathematics, four hours ; Theory of algebraic curves, three hours ; Seminar, two hours.—By Professor H. STAHL : Higher analysis, II., four hours ; Partial differential equations, three hours ; Seminar, two hours.—By Professor L. MAURER : Descriptive geometry, II., one hour, with exercises, two hours ; Calculus of variations, two hours, with exercises, one hour ; Exercises in elementary geometry, one hour.

UNIVERSITY OF VIENNA.—By Professor R. v. ESCHERICH : Theory of functions five hours ; Proseminar, one hour ; Seminar, two hours.—By Professor L. GEGENBAUER : Elements of infinitesimal calculus, five hours, with exercises ; Proseminar, one hour ; Seminar, two hours.—By Professor F. MERTENS : Algebra, five hours ; Proseminar, one hour ; Seminar, one hour.—By Professor G. KOHN : Analytical geometry, four hours, with exercises, one hour ; Differential geometry, II., one hour ; The methods of descriptive geometry, one hour.—By Dr. V. SERSAWY : Lectures on the mathematics of insurance, two courses of three and four hours respectively.—By Dr. A. TAUBER : Mathematics of

insurance, four hours, with exercises, two hours.—By Dr. E. BLASCHKE: Mathematical statistics, 3 hours.—By Dr. R. D. V. STERNECK: Differential geometry, two hours; Kummer's theory of ideal numbers, one hour.—By Dr. K. CARDA: Theory of continuous groups, three hours.

OF the annual list of doctorates conferred by American universities during the academic year closing with June, 1901, *Science* records the following whose theses were in mathematics, the names of the universities conferring the degrees and the subjects of the dissertations being appended: GRACE ANDREWS, Columbia University, "The primitive double minimal surface of the seventh class and its conjugate"; C. W. MCG. BLACK, Harvard University, "The parametric representation of the neighborhood of a singular point of an analytic function"; B. S. EASTON, University of Pennsylvania, "Substitutions and substitution groups"; W. FINDLAY, University of Chicago, "The Sylow subgroups of the symmetric group on k letters"; W. B. FITE, Cornell University, "On metabelian groups"; W. S. FRANKLIN, Cornell University, "Poynting's theorem"; A. S. GALE, Yale University, "On a particular class of algebraic minimum curves and surfaces"; C. N. HASKINS, Harvard University, "On the invariants of quadratic differential forms"; ARCHIBALD HENDERSON, University of South Carolina, "The cone of normals and an allied cone for central surfaces of the second degree"; L. I. HEWES, Yale University, "Some properties of path curves of continuous projective groups"; H. G. KEPPEL, Clark University, "The cubic 3-spread ruled with planes in 4-fold space"; H. W. KUHN, Cornell University, "On imprimitive substitution groups"; CHARLOTTE E. PINGRA, University of Wisconsin, "On functions connected with special Riemann surfaces, in particular those for which $p = 3, 4, 5$ "; I. E. RABINOVITCH, Johns Hopkins University, "The foundation of the euclidean geometry, as viewed from the standpoint of kinematics"; F. E. ROSS, University of California, "Differential equations belonging to a ternary linearoid group"; E. B. SKINNER, University of Chicago, "On ternary monomial substitution groups of finite order with determinant ± 1 "; ROXANA H. VIVIAN, University of Pennsylvania, "The poles of a right line with respect to a curve of order n "; J. N. VAN DER VRIES, Clark University, "On the multiple points of twisted curves"; E. B. WILSON, Yale University, "The decomposition of the general collineation in space into three skew reflections";

RUTH G. WOOD, Yale University, "Non-euclidean displacements and symmetry transformations."

The list includes twenty names; the corresponding number in the year preceding was eleven.

THREE fasciuli of the Encyclopædia of the mathematical sciences have thus far appeared during the present calendar year. These are: Volume I, No. 6; Volume IV₂, No. 1; and Volume IV₁, No. 1. In press are: Volume I, No. 7 (concluding number); Volume II₁, No. 5; Volume II₂, No. 1; and Volume IV₁, No. 2. The *Archiv der Mathematik und Physik* has opened a special department for corrections, additions, and suggestions relative to the Encyclopædia. A considerable number of notes thus collected have been reprinted and inserted at the beginning of Volume IV₁, No. 1.

THE Yale bicentennial series, about to be issued by Charles Scribner's Sons, New York, includes two volumes representing mathematics: Elementary principles in statistical mechanics, by Professor J. WILLARD GIBBS; Vector analysis, a text book for the use of students of mathematics and physics, by Dr. E. B. WILSON.

MESSRS. LONGMANS AND Co. announce a text-book on "Higher mathematics for students of chemistry and physics" by Mr. J. W. MELLOR.

THE following are recent catalogues of new and second-hand works in the mathematical sciences: No. 205, S. Calvary and Co., Berlin; No. 28, Kirchoff and Wigand, Leipsic; No. 220, Albert Raustein, Zürich; No. 183, Mayer and Müller, Berlin; No. 77, Max Weg, Leipsic.

M. HERMANN, of Paris, is preparing a catalogue which is expected to appear in November.

THE firm of Gustav Fock, of Leipsic, has recently issued a catalogue containing about forty-five hundred titles of works in mathematics and physics drawn chiefly from the libraries of the late Professors OSCAR SCHLÖMILCH and ELWIN BRUNO CHRISTOFFEL.

ARRANGEMENTS were made by the Société des amis des sciences physiques et mathématiques of Poltava, Russia, to celebrate the centenary of the birth of MICHEL OSTROGRADSKY at Poltava on September 12-15.

PROFESSOR M. CANTOR, of the University of Heidelberg, recently celebrated the fifty year jubilee of his doctor's degree which he obtained at twenty-two years.

PROFESSOR J. J. THOMSON and Dr. J. LARMOR, of Cambridge University were among the recipients of the honorary degree of doctor of laws of the University of Glasgow conferred at the recent celebration of the ninth jubilee of that institution.

PROFESSOR W. W. JOHNSON, of the U. S. Naval Academy, has written a treatise on theoretical mechanics, which has just appeared from the press of John Wiley and Sons of New York.

A MEDALLION of the late Professor Charles Hermite will be placed in the Court of Honor of the Sorbonne.

PROFESSOR E. PICARD, of the Sorbonne, has been elected to foreign membership in the Reale Accademia dei Lincei of Rome.

PROFESSOR M. NÖTHER, of Erlangen, has been elected corresponding member of the Lombardy academy of sciences of Milan.

PROFESSOR F. ENGEL, of Leipsic, has received the gold Lobachevsky medal for his report (Gutachten) on Killing's work in connection with the award of the Lobachevsky prize by the University of Kazan (see BULLETIN, volume 7, p. 191).

DR. L. V. PRANTL, of Nuremberg, has been appointed professor of technical mathematics in the University of Jena.

PROFESSOR A. MAYER, of Leipsic, will not lecture during the coming winter semester, and will probably retire permanently.

DR. M. VON RUDZKI has been promoted to a full professorship of mathematical geodesy at the University of Cracow.

DR. KARL CARDA has qualified as docent in mathematics at the University of Vienna, Dr. EDMUND LANDAU at the University of Berlin, and Dr. E. WEINHOLDT at the University of Kiel.

M. A. MANNHEIM, of the École Polytechnique of Paris, has retired from the active duties of his professorship after a tenure of thirty-seven years. His successor is M. HAAG.

MR. FREDERICK H. SEARES, recently instructor in astronomy at the University of California, has been appointed to the professorship in astronomy at the University of Missouri.

DR. J. M. PAGE has been promoted to a full professorship of mathematics at the University of Virginia.

DR. C. N. LITTLE, recently of Stanford University, has received the appointment of professor of civil engineering in the University of Idaho.

PROFESSOR T. C. ESTY, of Amherst College, has been appointed to the professorship of mathematics at the University of Rochester, succeeding Professor A. L. BAKER who has accepted a position in the Manual Training High School, Brooklyn, N. Y.

MR. PAUL ARNOLD has been appointed professor of mathematics in the University of Southern California.

DR. D. A. MURRAY, of Cornell University, has been appointed professor of mathematics in Dalhousie College, Halifax, Nova Scotia.

AT Ohio State University Professor J. E. BOYD has been promoted to an associate professorship of mathematics and Mr. D. E. RASOR has been appointed instructor in mathematics.

DR. H. F. STECKER has been appointed to an instructorship in mathematics at Cornell University.

DR. FREDERICK H. SAFFORD has resigned from the mathematical staff of the University of Cincinnati.

DR. E. C. LUNN, of the University of Chicago, has been appointed instructor in mathematics and astronomy at Wesleyan University.

MR. S. W. REAVES has been appointed to an assistant professorship of mathematics in Clemson College, S. C.

MR. H. C. MORENO has been appointed instructor in mathematics in Stanford University.

MR. A. B. PIERCE, of the University of California, has received leave of absence and will spend the present academic year abroad.

DR. C. W. M. BLACK has been appointed instructor in mathematics in the University of Oregon.

PROFESSOR E. M. WOOD, of Baker University, Baldwin, Kansas, has been appointed professor of mathematics and astronomy at Albion College, Michigan, to succeed Professor HENRY BENNER, who was drowned at Lake Orion, August 14.

MR. CHARLES A. SCHOTT, chief of the computing division of the U. S. Coast and Geodetic Survey from 1855 to 1899, died at Washington, July 31, 1901.

THE deaths are announced of W. SCHUR, professor of astronomy of the University of Göttingen, aged 55 years; of Admiral DE JONQUIÈRES, of Paris, well known for his researches in geometry; of Mr. J. HAMBLIN SMITH, the author of numerous successful text-books in elementary mathematics, at the age of seventy-four years; of Professor P. HELMLING, of the University of Dorpat, at the age of 84.

PROFESSOR PETER GUTHRIE TAIT died at Edinburgh on July 4. He was born at Dalkeith in 1831 and was a student at Edinburgh University. Later he attended Cambridge University where he was senior wrangler, first Smith's prizeman and fellow of Peterhouse. In 1854 he became professor of mathematics at Queen's College, Belfast, whence he removed in 1860 to the chair of natural philosophy in the University of Edinburgh. He was the author of a long series of publications both technical and popular in character. His scientific papers were collected and published in 1898.

NEW PUBLICATIONS.

I. HIGHER MATHEMATICS.

ASCOLI (G.). See BRIOSCHI (F.).

BAUSCHINGER (J.). See ENCYKLOPÄDIE.

BELTRAMI (E.). See BRIOSCHI (F.).

BIANCHI (L.). *Lezioni sulla teoria delle funzioni di variabile complessa e delle funzioni ellittiche.* Pisa, Spoerri, 1901. 8vo. 608 pp. Fr. 20.00

BOHLMANN (G.). See ENCYKLOPÄDIE.

BOREL (E.). See CAUCHY (A.).

BORGMEYER (J.). *Diskussion einer cyklischen Fläche dritter Ordnung.* (Progr.) Duderstadt, 1901. 8vo. 29 pp.

BORTKIEWICZ (L. VON). See ENCYKLOPÄDIE.

BRIOSCHI (F.). *Opere matematiche, pubblicate per cura del comitato per le onoranze a F. Brioschi (G. Ascoli, E. Beltrami, G. Colombo, L. Cremona, G. Negri, G. Schiaparelli).* (In 4 volumi.) Vol. I. Milano, Hoepli, 1901. Folio, 12 + 416 pp., portrait. Fr. 25.00