pretation of the symbols employed are taken literally from
Professor Study's book, page 461.

The transition from G_{16} to G_{17} was discussed by Professor
Klein in the lecture of June 15, 1903, of his course on the en-
cyclopedia of geometry. My own explanation would have been
improved had I further quoted from this lecture.

In regard to Professor Müller's paper I will add that the
"first and smaller half" of Professor Study's volume contains
pages 1–240. The entire development of ε and of G_{17} is con-
tained in pages 225–240.

I regret having used the word self-conscious. While I de-
sired to emphasize that the book was hard to read on account
of the style, I had neither cause nor inclination to make any
personal reflection on its author.

<div align="right">VIRGIL SNYDER.</div>

NOTES.

THE sessions of the mathematical department of the interna-
tional congress of science at St. Louis, will open on Tuesday,
September 20, with addresses by Professors MAXIME BÔCHER
and JAMES PIERPONT. Professor Bôcher's address will be of
a theoretical and critical character; Professor Pierpont will pre-
sent a historical resumé of mathematical progress in the nine-
teenth century. On the following days of the meeting (Wed-
nesday–Friday) the three sections of the department will meet
separately, but at different hours. The principal speakers be-
fore the sections will be: Section 1, analysis and algebra,
Professors E. PICARD and H. MASCHKE; Section 2, geometry,
Professor G. DARBOUX and Dr. EDWARD KASNER; Section
3, applied mathematics, Professors H. POINCARÉ and L. BOLTZ-
MANN. A detailed announcement of titles of the several ad-
dresses, arrangement of hours, etc., will be made in June by the
exposition committee on congresses, of which Professor SIMON
NEWCOMB is president.

THE National academy of sciences held its annual meeting at
Washington, D. C., April 19–23. The only mathematical
paper was by Mr. C. S. PEIRCE, "On the simplest branches of
mathematics." The officers of the preceding year were re-

elected. Professor W. F. OSGOOD, of Harvard University, was one of the new members elected at this meeting. Professor G. H. DARWIN, of Cambridge University, was elected foreign associate of the academy.

THE British association for the advancement of science will meet in Cambridge, England, August 17, 1904. Professor H. LAMB is president of section A, mathematics and physics.

THE officers of the French mathematical society for the present year are : President, Professor E. CARVALLO ; secretaries, Professors R. BRICARD and A. GRÉVY. The new annual list of members of the society contains 304 names.

AT the Breslau meeting of the German mathematical society, September 19–24, the president, Professor H. WEBER, will be represented by Professor F. KLEIN and the secretary, Professor A. KRAZER, by Professor A. GUTZMER.

AT the meeting of the London mathematical society held on April 14, the following papers were read : By Professor F. MORLEY, "On a plane quintic curve"; by Mr. H. T. HAVE-LOCK, "Mathematical analysis of wave propagation in isotropic space of p dimensions"; by Rev. E. W. BARNES, "On functions generated by linear differential equations of the first order"; by Mr. G. W. HARDY, "Note in addition to a former paper on conditionally convergent multiple series"; by Mr. H. HILTON, "Spherical curves II"; by Mr. P. W. WOOD, "Perpetuant syzygies of degree four"; by Rev. F. H. JACKSON, "Transformations of the function $F(\alpha, \beta, \gamma, x)$"; by Professor G. A. MILLER, "An extension of Sylow's theorem"; by Rev. J. CULLEN, "Note on a system of linear congruences"; by Rev. F. H. JACKSON, "An extension of Neumann's addition theorem for Bessel functions"; by Dr. H. F. BAKER, Transvectant operators in connection with binary forms"; by Lieut. Colonel A. CUNNINGHAM, "Factors of $13^{39}-1$."

PROFESSOR OSKAR BOLZA'S Lectures on the Calculus of Variations are in press and will appear in July. The book, which will contain from 250 to 300 pages, is based upon the lectures delivered by Professor Bolza at the Ithaca colloquium in 1901. It treats that class of problems of the calculus of variations in which definite integrals are considered, which depend upon a plane curve and contain no higher derivatives than

the first. The following subjects are discussed in detail : Euler's differential equation, Legendre's condition, Jacobi's condition, sufficient conditions; the case of variable end points; Weierstrass's theory of the problem in parameter representation; Kneser's theory; isoperimetric problems; Hilbert's existence theorem. The Lectures will be published as one of the volumes of the Decennial Publications of the University of Chicago.

UNDER the title of Rational Geometry, Professor G. B. HALSTED, of Kenyon College, Ohio, has prepared a school geometry based upon the researches of Hilbert. The book includes both plane and solid geometry and contains about two hundred and seventy pages. It will be published by John Wiley and Sons in a few weeks.

A THREAD model of the quintic scroll having three double conics, with the simple conic marked by a series of small beads on the generators, has been constructed by Mr. R. P. BAKER, of Union Academy, Anna, Ill. The model is about twelve inches cube, and brings out the form of the surface very clearly. Duplicates can be procured from Mr. Baker.

DR. THOMAS MUIR has recently issued a reprint of his paper entitled " A third list of writings on determinants," published in the Report of the South African association for the advancement of science, for 1903. Dr. Muir's first two lists are well known, having appeared in the *Quarterly Journal of Mathematics*, volumes 18 and 19. The first list covered the period 1693–1880 and contained 589 titles ; the material collected was used in the author's work on the history of the theory. The second list covered the period 1784–1885, supplying 84 titles not given in the first list, and adding 176 for the five years 1880 to 1885. The present list covers the period 1748–1900, adding 138 titles to the first list, 56 to the second, and 711 titles since 1885. The total list now includes 1,744 titles, and is thought to be complete to the close of the nineteenth century.

THE universities below offer during the academic year 1904–1905 advanced courses in mathematics as follows :

BROWN UNIVERSITY.— By Professor H. P. MANNING : Theory of functions, three hours ; Differential equations, three hours ; Advanced algebra, three hours.

BRYN MAWR COLLEGE.— By Professor CHARLOTTE A. SCOTT: Modern pure geometry, two hours; Theory of transformation and geometry on a curve, two hours.—By Mr. J. E. WRIGHT: Differential equations, two hours; Theory of continuous groups, two hours.— By Dr. ISABEL MADDISON: Analytic geometry of three dimensions, one hour.

UNIVERSITY OF CALIFORNIA.—By Professor I. STRINGHAM: Theory of functions of a complex variable, three hours; Logic of mathematics, three hours; Seminar, two hours.—By Professor G. C. EDWARDS: Differential equations, three hours.— By Professor M. W. HASKELL: Elliptic and other special functions (first half year), three hours; Analytic projective geometry, three hours; Quaternions (second half year), three hours.—By Professor C. A. NOBLE: Theory of equations, two hours; Advanced analytic geometry (first half year), three hours; Differential geometry, three hours.—By Mr. A. W. WHITNEY: Theory of probabilities, one hour.—By Dr. D. N. LEHMER: Synthetic geometry (first half year), three hours; Theory of numbers, three hours.—By Dr. T. M. PUTNAM: Partial differential equations (first half year), two hours; Theory of groups (second half year), three hours.

UNIVERSITY OF CHICAGO. — Professor O. BOLZA will lecture on calculus of variations during the summer session, instead of integral calculus as announced in the May BULLETIN.

CLARK UNIVERSITY. — By Professor W. E. STORY: Advanced analytic geometry, five hours; Algebraic invariants (first half year), two hours; Finite differences (second half year), two hours; Seminar. — By Professor H. TABER: Theory of functions and elliptic functions, five hours; Transformation groups (second half year), two hours; Seminar. — By Mr. J. DE PEROTT: Theory of numbers (first half year), two hours; Algebraic substitutions and their application to the theory of equations (second half year), two hours.

COLUMBIA UNIVERSITY.—By Professor T. S. FISKE: Advanced calculus, three hours; Functions defined by linear differential equations, three hours.—By Professor F. N. COLE: Introduction to the theory of functions, three hours; Theory of invariants, three hours.—By Professor R. S. WOODWARD: Advanced theoretical mechanics, two hours; Theory of the po-

tential function, two hours ; Mathematical theory of elasticity, two hours.—By Professor D. E. SMITH : History of mathematics, two hours.—By Professor JAMES MACLAY : Application of the calculus to the theory of surfaces, three hours.—By Professor C. J. KEYSER : General theory of assemblages, three hours.—By Dr. G. H. LING : Theory of numbers, probabilities, three hours.—By Dr. EDWARD KASNER : Differential equations and continuous groups, two hours.

CORNELL UNIVERSITY. — By Professor L. A. WAIT : Advanced analytic geometry, three hours ; Advanced differential calculus, three hours. — By Professor J. W. JONES : Algebra, three hours. — By Professor J. McMAHON : Theory of sound, three hours ; Theory of potential and spherical harmonics, two hours. — By Professor J. H. TANNER : Theory of equations, two hours. — By Professor J. I. HUTCHINSON : Projective geometry, three hours ; Theory of functions, three hours. — By Professor V. SNYDER : Algebraic plane curves, three hours. — By Dr. W. B. FITE : Theory of groups, three hours ; Definite integrals, two hours. — By Dr. C. N. HASKINS : Advanced differential equations, three hours ; Calculus of variations, two hours. The Oliver mathematical club will hold weekly sessions.

UNIVERSITY OF MINNESOTA. — By Professor J. F. DOWNEY : Advanced calculus (first semester), three hours ; Curve tracing (second semester), three hours. — By Professor G. N. BAUER : Determinants and solid analytic geometry, three hours. — By Dr. J. E. MANCHESTER : Differential equations, three hours. — By Professor F. P. LEAVENWORTH : Method of least squares (first semester), three hours. — By Professor H. T. EDDY : Fourier's series and spherical harmonics (first semester), three hours ; Theoretical mechanics, three hours.

UNIVERSITY OF NEBRASKA. — By Professor W. E. DAVIS : Number theory, three hours (first semester); Finite differences, three hours (second semester). — By Professor CANDY : Analytic geometry, three hours ; Differential equations, three hours. — By Professor MORITZ : Mathematical pedagogy, three hours. — By Mr. H. A. MORRISON : Algebra, three hours.

NORTHWESTERN UNIVERSITY. By Professor H. S. WHITE : Algebraic twisted curves. — By Dr. J. W. YOUNG : Differential equations of physics.

UNIVERSITY OF PENNSYLVANIA. — By Professor E. S. CRAWLEY : Advanced methods of plane analytic geometry, two hours; Theory of numbers, three hours. — By Professor G. E. FISHER : Differential equations, two hours ; Theory of functions of a complex variable (first half year), three hours ; Elliptic functions (second half year), three hours. — By Professor I. J. SCHWATT : Theory of functions of a real variable, three hours. — By Dr. G. H. HALLETT : Theory of surfaces, two hours ; Theory of groups, two hours. — By Dr. B. S. EAS- TON : Theory of higher equations, two hours ; Algebra (Netto's book will be read in German), one hour. — By Dr. F. H. SAF- FORD : Fourier's series and spherical harmonics, three hours. — By Dr. L. I. NEIKIRK : Galois theory of equations, two hours; Introduction to the theory of modular functions, two hours.

PRINCETON UNIVERSITY. — By Professor H. B. FINE : Elements of the theory of functions ; Theory of functions of a complex variable ; Ordinary differential equations. — By Pro- fessor H. D. THOMPSON : Theory of curves and surfaces ; Ad- vanced infinitesimal geometry ; Special topics in metrical geo- metry. — By Professor E. O. LOVETT : Partial differential equations (second semester) ; Lie's transformation groups and applications ; Analytic mechanics. — By Mr. A. H. WILSON : Elliptic functions. — By Dr. GILLESPIE : Theory of substi- tutions and of invariants. — By Dr. L. P. EISENHART : Defor- mation of surfaces (second semester) ; Congruences and com- plexes (second half year). Each course is given two hours a week.

STANFORD UNIVERSITY. — By Professor R. L. GREEN : Theory of equations, three hours ; Modern analytic geometry, two hours. — By Professor G. A. MILLER : Elementary theory of groups, three hours ; Projective geometry, two hours (first semester) ; Theory of numbers, two hours (second semester). — By Professor H. F. BLICHFELDT : Differential equations, three hours. — By Professor L. M. HOSKINS : Theoretical mechanics, five hours.

SYRACUSE UNIVERSITY. — By Professor W. H. METZLER : Advanced analytic geometry (first half year) three hours ; Modern geometry (second half year), three hours ; Elliptic

integrals and elliptic functions, three hours ; General theory of functions of a complex variable, three hours. — By Professor E. D. ROE : Symmetric functions and invariants, three hours ; Advanced calculus and differential equations, three hours ; Analytic mechanics, three hours ; Theory of equations, three hours ; Analytic trigonometry (first half year), one hour ; Determinants (second half year), one hour. — By Professor W. G. BULLARD : Projective geometry and higher plane curves, three hours.

UNIVERSITY OF VIRGINIA. — By Professor W. H. ECHOLS : Theory of functions, three hours ; Geometry, three hours. — By Professor J. M. PAGE : Differential equations, three hours ; Differential geometry, three hours. — By Mr. W. B. STONE : Advanced differential and integral calculus, three hours.

UNIVERSITY OF WISCONSIN. — By Professor C. A. VAN VELZER : Differential equations, three hours ; Theory of numbers, two hours. — By Professor C. S. SLICHTER : Theoretical mechanics, three hours ; Newtonian potential function, two hours ; Theoretical hydrodynamics, two hours. — By Professor E. B. SKINNER : Quaternions, three hours ; Differential geometry (first semester), three hours ; Theory of invariants, two hours ; Theory of groups of a finite order, three hours. — By Professor L. W. DOWLING : Projective geometry, two hours ; Theory of functions, two hours ; Advanced projective geometry, two hours.

(Summer session.) — By Professor C. S. SLICHTER : Differential equations ; Analytic mechanics. — By Professor L. W. DOWLING : Invariants ; Theory of functions. Each course will be given five hours a week.

PROFESSOR J. SOBOTKA, of the technical high school at Brünn has been appointed professor of mathematics at the Bohemian university at Prague.

LORD KELVIN was unanimously elected to the chancellorship of the University of Glasgow, April 6.

PROFESSOR C. GUICHARD has been elected a member of the Paris academy of sciences in the section of geometry ; Professor V. VOLTERRA has been elected corresponding member of the academy.

DR. E. FISCHER has been appointed docent in the technical high school at Brünn.

AT the installation of President C. S. Howe at the Case School of Applied Science on May 11, the AMERICAN MATHEMATICAL SOCIETY was officially represented by Professor C. A. WALDO.

AT the University of Michigan Professor ALEXANDER ZIWET has been promoted to a full professorship in mathematics, and Professor J. L. MARKLEY to a junior professorship.

PROFESSOR MAXIME BÔCHER has been made full professor of mathematics at Harvard University.

DR. G. A. BLISS, of Chicago, has been appointed assistant professor of mathematics in the University of Missouri.

DR. J. E. MANCHESTER has been appointed instructor in mathematics at the University of Minnesota.

DR. L. C. KARPINSKI, of the Oswego Normal School, will have charge of the mathematical courses of New York University during the summer session of 1904.

DR. C. N. HASKINS has been appointed instructor in mathematics at Cornell University.

MR. H. A. MORRISON has been appointed assistant in mathematics at the University of Nebraska. Messrs. C. H. SISAM and O. P. AKERS have been appointed assistants in mathematics at Cornell University.

MR. E. A. MILLER, of the Massachusetts Institute of Technology, has been granted a leave of absence and will spend next year at European universities.

RECENT catalogues of second-hand books on mathematics: H. WELTER, 4 rue Bernard-Palissy, Paris, catalogue No. 112, 34 pages (about 1300 titles), mathematics, physics and chemistry; Mayer and Müller, Prinz Louis Ferdinandstrasse 2, Berlin N. W., catalogue No. 203, pp. 130, mathematics; Gustav

Fock, Schlossgasse 7–9, Leipzig, catalogue No. 240, 1726 titles on mathematics; Süddeutsches Antiquariat, Gallerie-strasse 20, Munich, catalogue No. 55, 1231 titles in mathematics, physics and astronomy.

CHARLTON T. LEWIS, eminent publicist, died at Morristown, N. J., on May 26th, at the age of seventy. Dr. Lewis was a member of the Actuarial Society of America and, since 1891, of the AMERICAN MATHEMATICAL SOCIETY.

NEW PUBLICATIONS.

I. HIGHER MATHEMATICS.

AMES (L. D.). On a theorem of analysis situs relating to the division of the plane or of space by a closed curve or surface. (*Bulletin of the American Mathematical Society*, (2) Vol. 10, pp. 301–305.)

BACH (H.). Die Umformungen der Kettenbrüche. (Diss.) Giessen, 1903. 8vo. 40 pp.

BASTIAN (A.). Das logische Rechnen und seine Aufgaben. Berlin, 1903. 8vo. 176 pp. M. 4.00

BJERKNES (V.). Karl Anton Bjerknes. Gedächtnisrede, gehalten vor der Gesellschaft der Wissenschaften zu Christiania am 17. April 1903. Mit einem Bildnis. Leipzig, Barth, 1904. 8vo. 31 pp. M. 1.20

BRAHY (E.). Exercices méthodiques de calcul intégral. Nouvelle édition entièrement revue. Paris, Gauthier-Villars, 1903. 8vo. 301 pp. Fr. 5.00

CAPELLI (A.). Lezioni sulla teoria delle forme algebriche. (Paris, Gauthier-Villars), Napoli, Pellerano, 1902. 8vo. 295 pp. (Lith.). Fr. 10.00

ENGEL (F.). See GRASSMANN (H.).

FESTSCHRIFT, Ludwig Boltzmann gewidmet zum 60sten Geburtstage, 20. II. 1904. Leipzig, Barth, 1904. 8vo. 12 + 930 pp., 2 plates, 1 portrait. M. 18.00

GAZZANIGA (P.). Gli elementi della teoria dei numeri. Verona e Padova, Drucker, 1903. 8vo. 7 + 408 pp. Fr. 8.00

GRASSMANN (H.). Gesammelte mathematische und physikalische Werke. Auf Veranlassung der mathematisch-physischen Klasse der kgl. Sächsischen Gesellschaft der Wissenschaften und unter Mitwirkung der Herren J. Lüroth, E. Study, J. Grassmann, H. Grassmann d. J., G. Scheffers herausgegeben von F. Engel. Vol. II, Teil 1: Die Abhandlungen zur Geometrie und Analysis, herausgegeben von E. Study, G. Scheffers und F. Engel. Leipzig, Teubner, 1904. 8vo. 460 pp.