tion. On the other hand the author has demanded a minimum prerequisite knowledge of analysis. This requirement is limited to elementary analytic geometry and calculus, to which may be added a few of the formulas for vector products given in the introductory chapters.

The exposition of the geometry of forces begins in Chapter 6 with a consideration of instantaneous rotations. This is followed by chapters on forces and force systems, foundations of line geometry, and equilibrium. The next six chapters are devoted to the theory of screws and are followed by two chapters on deformations, the point of view throughout this portion being purely geometric. The concepts of mechanics are taken up in the last six chapters, of which two are given to deformable bodies. The four chapters on kinetics of rigid bodies deal with the equations of motion in general, free motion under no applied forces, motion with two degrees of freedom, and with three degrees of freedom. The special case of a system of forces in a plane is excluded throughout, and in the free motion of a rigid body it is assumed that the axis of rotation does not have a fixed direction in space.

The necessary complications of notation in this subject have been reduced by the systematic use of different styles of type, thus avoiding an excessive number of accents and subscripts. For the convenience of the reader the scheme of notation is exhibited in a table at the end of the book.

There are many misprints, but fortunately most of them are self-evident and will not cause confusion.

<div align="right">W. R. LONGLEY.</div>

NOTES.

THE seventeenth summer meeting of the AMERICAN MATHEMATICAL SOCIETY will be held at Columbia University on Tuesday and Wednesday, September 6–7. Abstracts of papers intended for presentation at this meeting should be in the hands of the Secretary not later than August 20.

THE April number (volume 32, number 2) of the *American Journal of Mathematics* contains the following papers : " The reduction of families of bilinear forms," by H. E. HAWKES ; " Basic systems of rational norm-curves," by J. R. CONNER ; " Surfaces invariant under infinite discontinuous birational

groups defined by line congruences," by V. SNYDER; "The apparent size of a closed curve," by C. A. LUNN; "On linear transformations which leave an Hermitian form invariant," by J. I. HUTCHINSON.

THE April number (volume 11, number 3) of the *Annals of Mathematics* contains: "A generalization of the game called nim," by E. H. MOORE; "A simple method for graphically obtaining the complex roots of a cubic equation," by R. E. GLEASON; "The topography of certain curves defined by a differential equation," by F. R. SHARPE; "Abel's theorem and some addition formulæ for elliptic integrals," by H. H. BARNUM; "On the determination of the asymptotic developments of a given function," by W. B. FORD; "The integral roots of certain inequalities," by W. H. JACKSON.

AT the meeting of the London mathematical society held on April 28 the following papers were read: By W. F. SHEP-PARD, "On the accuracy of interpolation by finite differences;" by G. H. HARDY, "Note on Maclaurin's test for the convergence of series;" by A. J. C. CUNNINGHAM, "The factorization of $2^{77} + 1$ and the divisibility of $2^p - 2$ by p^2, p being prime."

THE proceedings of the Fourth international congress of mathematicians, which was held at Rome in April, 1908, have been distributed to the members, and can now be obtained from the publisher. Especially should public and university libraries avail themselves of the opportunity to procure this carefully prepared digest of the progress of pure and applied mathematics. The complete report appears in three volumes, and can be obtained from the firm of E. Loescher, in Rome, for 35 francs. The volumes are not sold separately. The titles are as follows: Atti del IV Congresso internazionale dei Matematici, publicati per cura del Segretario Generale G. CASTELNUOVO, Roma; Tipografia della R. Accademia dei Lincei. Volume I (Relazione sul congresso, Discorsi e conferenze), 8vo, iv+216 pp., 1909; Volume II (Comunicazioni delle Sezioni I e II, matematica pura), 8vo, 315 pp., 1909; Volume III (Comunicazioni delle Sezioni III A, III B e IV, matematica applicata), 8vo, 583 pp., 1909.

AT a meeting of the Cambridge mathematical club on March 8 Sir ROBERT BALL delivered a lecture on Halley's comet.

The Club was founded four or five years ago with the hope of promoting the exchange and discussion of mathematical ideas among teachers of mathematics resident in Cambridge and the more proficient of their pupils. The meetings are held two or three times a term, and are usually comparatively small and quite informal, though occasionally a lecture or paper of a more formal character is presented. The subjects for discussion are sometimes branches of mathematical or physical theory, sometimes questions regarding mathematical teaching or examining. There is no publication in any way connected with the Club. The present President is Sir GEORGE DARWIN, and the Secretaries are Dr. T. J. I'A. BROMWICH and Mr. G. H. HARDY.

THE committee on the teaching of mathematics to engineering students, appointed at the Chicago joint meeting of 1907, will present its report at the meeting of the Society for the promotion of engineering education at Madison, Wis., June 23–25. Mathematicians who may be interested are invited to attend this important meeting.

THE mathematics section of the central association of science and mathematics teachers has issued a pamphlet entitled " Applied problems in algebra and geometry," compiled by a committee appointed for the purpose, containing 103 exercises taken from practical applications of these sciences. Copies may be secured, at 5 cents each, from the secretary of the section, Miss Mabel Sykes, Bowen High School, Chicago, Illinois.

TWO new chairs in mathematics have been established at the University of Paris, and one at Lyons and one at Toulouse; the occupants have not yet been announced.

THE following courses in mathematics are announced for the summer semester :
UNIVERSITY OF BERLIN. — By Professor H. A. SCHWARZ : Surfaces and space curves, four hours; Elliptic functions, four hours; Selected chapters in the theory of analytic functions, two hours; Colloquium, two hours; Seminar, two hours. — By Professor G. FROBENIUS : Theory of determinants, four hours; Seminar, two hours. — By Professor F. SCHOTTKY : Elementary theory of functions, four hours; Automorphic functions, four hours; Seminar, two hours. — By Professor R. LEHMANN-FILHÉS : Absolute perturbations according to Hansen, four hours; Analytic mechanics, four hours. — By Professor G.

HETTNER: Introduction to the theory of ordinary differential equations, two hours. — By Professor J. KNOBLAUCH: Applications of elliptic functions, four hours; Integral calculus, four hours; Selected chapters in differential calculus, four hours. — By Professor I. SCHUR: Differential calculus, with exercises, five hours; Theory of algebraic equations, two hours.

THE following courses in mathematics are announced for the academic year 1910–1911.

UNIVERSITY OF CHICAGO. — By Professor E. H. MOORE: Introduction to general analysis: Theory of functions of infinitely many variables; Integral equations in general analysis; Seminar on the foundations of pure mathematics; each two hours throughout the year. — By Professor L. E. DICKSON: Finite groups, four hours, first term; General algebra, four hours, second term; Quadratic forms, four hours, third term. — By Professor F. R. MOULTON: Modern theories of analytic differential equations with applications to celestial mechanics, four hours, all three terms. — By Professor E. J. WIL-CZYNSKI: Theory of plane curves, four hours, first term; Projective differential geometry of ruled surfaces and space curves, four hours, second term; Projective differential geometry of non-ruled surfaces and congruences, four hours, third term. — By Professor K. LAVES: Analytic mechanics, four hours, first and second terms. — By Professor H. E. SLAUGHT: Differential equations, four hours, first term. — By Professor G. A. BLISS: Elliptic integrals, four hours, second term; Theory of definite integrals, four hours, third term; Fundamental existence theorems, two hours, second and third terms. —By Dr. A. C. LUNN: Hydrodynamics, four hours, first term; Differential equations of mathematical physics, the conduction of heat, four hours, third term.

Summer Quarter, June 20 to September 2. — By Professor E. H. MOORE: General analysis, four hours; Seminar on the foundations of mathematics, four hours; Graphical methods in algebra, four hours, all second term. — By Professor L. E. DICKSON: Theory of substitutions, four hours; Differential calculus, five hours. — By Professor J. W. A. YOUNG: Critical review of secondary mathematics, four hours; Advanced algebra, five hours. — By Professor G. A. BLISS: Functions of a complex variable, four hours; Modern analytic geometry, four hours. — By Professor E. J. WILCZYNSKI: Projective differ-

ential geometry, four hours; Integral calculus, five hours; Synoptic course in mathematics, five hours. — By Professor A. L. UNDERHILL: Differential equations, five hours; Plane analytic geometry, five hours; College algebra, five hours.

COLUMBIA UNIVERSITY. — By Professor T. S. FISKE: Theory of functions of a real variable, three hours; Functions defined by linear differential equations, three hours. — By Professor F. N. COLE: Theory of functions of a complex variable, three hours; Theory of plane curves, three hours. — By Professor JAMES MACLAY: Differential equations, three hours, second half-year; Differential geometry, three hours, second half-year.— By Professor D. E. SMITH: History of mathematics, two hours; Seminar in the history and teaching of mathematics.— By Professor C. J. KEYSER: Modern theories in geometry, three hours; Principles of mathematics, three hours. — By Professor EDWARD KASNER: Vector analysis, two hours, first half-year; Geometry of differential equations, two hours.

Summer session (July 6 to August 17). — By Professor A. T. DeLURY: Theory of functions of a complex variable, seven and one-half hours. — By Professor G. H. LING: Theory of groups of finite order, seven and one-half hours.— By Professor H. S. WHITE: Curves and surfaces of the third order, seven and one-half hours.

UNIVERSITY OF ILLINOIS. — By Professor S. W. SHATTUCK: Differential equations, three hours, first semester. — By Professor E. J. TOWNSEND: Theory of functions of a complex variable, three hours. — By Professor G. A. MILLER: Higher algebra, three hours, first semester; Theory of groups, three hours. — By Professor ———: Synoptic course, three hours; Differential geometry, three hours. — By Professor H. L. RIETZ: Actuarial theory, three hours, first semester; Theory of statistics, three hours. — By Professor J. W. ———: Elliptic functions, three hours. — By Professor C. H. SISAM: Algebraic surfaces, three hours. — By Dr. A. R. CRATHORNE: Advanced calculus, three hours, second semester; Theory of linear differential equations, three hours. — By Dr. R. L. BÖRGER: Projective geometry, three hours. — By Dr. G. E. WAHLIN: Partial differential equations, three hours, second semester. — By Dr. T. BUCK: Solid analytic geometry, three hours, second semester.

Summer of 1910. — By Professor G. A. MILLER: Theory of equations and determinants, five hours; Elementary theory of groups, three hours. — By Dr. E. B. LYTLE: Teachers' course,

five hours. — By Dr. G. E. WAHLIN : Differential equations, five hours.

INDIANA UNIVERSITY. — By Professor S. C. DAVISSON : Advanced calculus (a, w, s), three hours ; Fourier series (a), three hours ; Fundamental concepts of mathematics (w, s), two hours. — By Professor D. A. ROTHROCK : Systems of geometry (a, w), three hours ; Calculus of variations (s, sm), three hours ; History of mathematics (w), three hours. — By Professor U. S. HANNA : Theory of numbers (a), three hours ; Substitution groups and Galois theory (w, s), three hours. — By Mr. K. P. WILLIAMS : Functions defined by differential equations (a, w), two hours.

(a, w, s, sm = autumn, winter, spring, summer.)

Summer Quarter, June 22–September 3, 1910. — By Professor S. C. DAVISSON : Advanced calculus, five hours ; Modern analytic geometry, five hours. — By Professor D. A. ROTHROCK : History of mathematics, three hours; Ordinary differential equations, five hours. — By Professor U. S. HANNA : Advanced differential equations, five hours. — By Mr. K. P. WILLIAMS : Fourier series, three hours.

JOHNS HOPKINS UNIVERSITY. — By Professor F. MORLEY : Higher geometry, three hours, first half year; Theory of functions, three hours, second half year. — By Professor A. COHEN : Differential equations, two hours ; Calculus of variations, two hours, first half year. — By Professor A. COBLE : Theory of groups, two hours ; Theory of probabilities, two hours, second half year.

AT the meeting of the National academy of sciences held at Washington April 19–21, Professor F. R. MOULTON, of the University of Chicago, was elected to membership.

AT the meeting of the American philosophical society held on April 23 the following persons were elected to membership : President R. C. MACLAURIN, of the Massachusetts Institute of Technology, Professor B. O. PEIRCE, of Harvard University, Professor O. W. RICHARDSON, of Princeton University, and Professor C. E. PICARD, of the University of Paris.

PROFESSOR C. CARATHÉODORY, of the technical school at Hanover, has been appointed professor of mathematics at the newly established technical school at Breslau.

PROFESSOR R. DEDEKIND, of the technical school at Brunswick, has been elected foreign member of the academy of sciences at Paris.

PROFESSOR G. FABER, of the University of Tübingen, has been appointed professor of mathematics at the technical school of Stuttgart.

AT the University of Göttingen, Dr. A. HAAR and Dr. H. WEYL have been appointed docents in mathematics.

DR. W. SCHNEE has been appointed docent in mathematics at the University of Breslau.

MR. J. H. JEANS, formerly professor of mathematics in Princeton University, has been appointed Stokes lecturer in mathematics at Cambridge University.

AT Cornell University, Professors J. I. HUTCHINSON and VIGIL SNYDER have been promoted to full professorships of mathematics.

PROFESSOR OSKAR BOLZA, of the University of Chicago, has resigned and expects to reside in Freiburg, Germany. He will however retain his connection with the University as nonresident professor. Professor E. J. WILCZYNSKI, of the University of Illinois, has been appointed associate professor of mathematics at the University of Chicago.

AT the University of Wisconsin, Professor MAX MASON has been promoted to a full professorship of mathematical physics; Professor E. B. SKINNER has been promoted to an associate professor of mathematical physics; Mr. H. L. WOLF has been promoted to an assistant professorship of mathematics; Mr. S. E. URNER has been appointed instructor in mathematics.

PROFESSOR J. W. YOUNG, of the University of Illinois has been appointed head of the department of mathematics at the University of Kansas.

AT Columbia University Dr. C. C. GROVE has been made assistant professor of mathematics. Dr. N. J. LENNES has been appointed instructor in mathematics. Mr. C. B. UPTON has been promoted to an assistant professorship of mathematics in Teachers College. Professor JAMES MACLAY has been granted a half year's leave of absence which he will spend abroad.

AT the University of Pennsylvania hereafter the chairman of each department of instruction will be elected annually by

the department. For the year 1910–1911, Professor G. E. FISHER has been chosen chairman of the Department of Mathematics in the Graduate School, and Professor I. J. SCHWATT chairman of the Mathematical Department in the College.

AT the Georgia School of Technology, Mr. GEORGE RUTLEDGE and J. W. SPEAS have been appointed instructors in mathematics. Professor W. V. SKILES has been granted leave of absence to study at Harvard University. Mr. A. B. MORTON will resume his duties this fall, after a year's leave of absence at Brown University.

AT Stanford University, Mr. E. W. PONZER, of the University of Illinois, has been appointed assistant professor of mathematics; Mr. G. F. McEWEN has been appointed instructor in applied mathematics.

MR. A. S. HAWKESWORTH has been appointed instructor in higher mathematics and lecturer in Semitic languages at the University of Pittsburgh.

AT the University of Minnesota Dr. H. L. SLOBIN has been made instructor in mathematics.

DR. ELIZABETH R. BENNETT has been appointed instructor in mathematics at the University of Nebraska.

RECENT catalogues of second hand mathematical works: Mayer & Müller, Prinz Louis Ferdinandstrasse 2, Berlin, N. W., catalogue No. 247, containing about 4,000 titles. — List & Francke, Talstrasse 2, Leipzig, catalogue No. 419, containing 1052 titles. Süddeutsches Antiquariat, Galleriestrasse 20, Munich, catalogue 23, containing 1123 titles.

NEW PUBLICATIONS.

(In order to facilitate the early announcement of new mathematical books, publishers and authors are requested to send the requisite data as early as possible to the Departmental Editor, PROFESSOR W. B. FORD, 1345 Wilmot Street, Ann Arbor, Mich.)

I. HIGHER MATHEMATICS.

BERKELEY (H.). Mysticism in modern mathematic. Oxford University Press, 1910. 8vo. 12 + 264 pp. 8s.

BERNOULLI (J.). Ueber unendliche Reihen (1689–1704). Aus dem Lateinischen übersetzt und herausgegeben von G. Kowalewski. (Ostwald's Klassiker der exakten Wissenschaften.) Leipzig, Engelmann, 1909. 8vo. 141 pp. M. 2.50