NOTES.

THE July number (volume 13, number 3) of the *Transactions of the American Mathematical Society* contains the following papers: "Quaternion developments with applications," by J. B. SHAW; "Theory of finite algebras," by H. S. VANDIVER; "On the degree of convergence of the development of a continuous function according to Legendre's polynomials," by DUNHAM JACKSON; "Functional differential geometry," by LOUIS INGOLD; "On the extension of a theorem of Poincaré for difference-equations," by E. B. VAN VLECK; "One-parameter projective groups and the classification of collineations," by E. B. VAN VLECK; "Bicombinants of the rational plane quartic and combinants of the rational plane quintic," by J. E. ROWE.

THE July number (volume 34, number 3) of the *American Journal of Mathematics* contains: "Minimal surfaces in euclidean four space," by L. P. EISENHART; "A contribution to the foundations of Fréchet's Calcul Fonctionel," by T. H. HILDEBRANDT; "On the perspective Jonquières involutions associated with the (2, 1) ternary correspondence," by P. P. BOYD; "Some geometrical theorems connected with Laplace's equation and the equation of wave motion," by H. BATEMAN.

THE June number (volume 13, number 4) of the *Annals of Mathematics* contains: "On the rectilinear congruence realizing a circular transformation of one plane into another," by A. EMCH; "On Duhamel's theorem," by R. L. MOORE; "On linear equations with an infinite number of variables," by MAXIME BÔCHER and L. BRAND; "On the theory of correlation with special reference to certain significant loci on the plane of distribution in the case of normal correlation," by H. L. RIETZ.

THE Society for the Promotion of Engineering Education has reprinted as a separate volume the Syllabus of Mathematics compiled by its committee on the teaching of mathematics to students of engineering. The syllabus covers elementary algebra, geometry and mensuration, plane trigonometry, analytic geometry, calculus, and complex quantities.

The volume, which is neatly bound, is sold at cost price, seventy-five cents. Orders should be addressed to the Secretary of the society, Professor H. H. Norris, Cornell University, Ithaca, N. Y.

THE publishing house of Mattei and Co. in Pavia announces that the following books are in press: C. BURALI-FORTI and R. MARCOLONGO, "Analyse vectorielle générale, II.: Applications physico-mécaniques"; T. BOGGIO, "Analyse vectorielle générale: III. Hydrodynamique"; G. VIVANTI, "Esercizi di analisi infinitesimale."

THE publishing house of B. G. Teubner in Leipzig and Berlin announces that the following books are in press: A. BRILL, "Einführung in das Relativitätsprinzip"; R. MEHMKE, "Vorlesungen über Punkt- und Vektorenrechnung"; G. HESSENBERG, "Transzendenz von e und π"; E. R. NEUMANN, "Beiträge zu einzelnen Fragen der höheren Potentialtheorie"; O. PERRON, "Lehre von den Kettenbrüchen"; R. FRICKE and F. KLEIN, "Vorlesungen über automorphe Funktionen" (concluding fascicule); L. LEWENI, "Konforme Abbildung"; G. LORIA, "Vorlesungen über darstellende Geometrie, II"; H. E. TIMERDING, "Die Fallgesetze"; M. ZACHARIAS, "Einführung in die projective Geometrie."

THE annual list of American doctorates published in *Science* presents for the academic year 1911–1912, 492 names, of which 273 are credited to the sciences. The following 22 successful candidates offered mathematics as major subject (the titles of the theses are appended): H. DEF. ARNOLD, Chicago, "Limitations imposed by slip and inertia terms upon Stokes's law for the motion of spheres through liquids"; S. E. BRASEFIELD, Cornell, "A study of certain force fields"; E. W. CHITTENDEN, Chicago, "Infinite developments and the composition property $(K_{12}B_1)_*$ in general analysis"; A. L. DANIELS, Yale, "On the librations of bodies whose periods are one third that of the disturbing body"; W. W. DENTON, Illinois, "Projective differential geometry of developable surfaces"; L. L. DINES, Chicago, "The highest common factor of a system of polynomials with an application to implicit functions"; C. A. FISCHER,

Chicago, "Some contributions to the theory of functions of lines"; T. FORT, Harvard, "Problems connected with the linear difference equations of the second order with special reference to equations with periodic coefficients"; Miss C. B. HENNEL, Indiana, "Certain transformations and invariants connected with difference equations and other functional equations"; C. G. P. KUSCHKE, California, "The abelian equations of the 10th degree, irreducible in a given rational domain"; J. LIPKE, Columbia, "Natural families of curves in a general curved space of n dimensions"; F. M. MORGAN, Cornell, "Involutorial transformations"; R. E. ROOT, Chicago, "Iterated limits in general analysis"; L. P. SICELOFF, Columbia, "Simple groups from order 2001 to order 3640"; W. M. SMITH, Columbia, "Simply infinite systems of plane curves. A study of isogonals, equitangentials and other families of trajectories"; C. T. SULLIVAN, Chicago, "Properties of surfaces whose asymptotic lines belong to linear complexes"; J. I. TRACEY, Johns Hopkins, "Researches on the rational quintic"; E. E. WHITFORD, Columbia, "The Pell equation"; H. R. WILLARD, Yale, "On a family of oscillating orbits of short period (with a chart)"; A. H. WILSON, Chicago, "The canonical types of nets of quadratic forms in the Galois field of order p^n"; R. M. WINGER, Johns Hopkins, "On self-projective rational curves of the fourth and fifth order"; B. M. WOODS, California, "A discussion by synthetic methods of two projective pencils of conics."

THE following university courses in mathematics will be offered at German universities during the winter semester:

UNIVERSITY OF BONN.—By Professor E. STUDY: Differential and integral calculus, II, four hours; Seminar, two hours; Colloquium on the theory of invariants, one hour.—By Professor F. LONDON: Descriptive geometry, II, with exercises, four hours; Analytical mechanics, four hours.—By Professor F. HAUSDORFF: Analytic geometry, four hours; Linear differential equations, two hours.—By Dr. J. O. MÜLLER: Introduction to algebra and the theory of determinants, three hours; Exercises in the calculus, one hour.

UNIVERSITY OF HALLE.—By Professor A. WANGERIN: Analytic geometry of space, three hours; Partial differential

equations of mathematical physics, four hours; Selected chapters from the theory of surfaces, one hour; Seminar, two hours.—By Professor A. GUTZMER: Integral calculus, with exercises, four hours; Descriptive geometry, with exercises, four hours; Seminar, two hours.—By Professor V. EBERHARD: Algebraic equations, four hours; Colloquium, two hours.

UNIVERSITY OF LEIPZIG.—By Professor O. HÖLDER: Mechanics, five hours; Foundations of arithmetic, two hours; Seminar, two hours.—By Professor K. ROHN: Applications of the calculus to surfaces and space curves, four hours; Descriptive geometry, II, with exercises, four hours.—By Professor G. HERGLOTZ: Differential and integral calculus, five hours; Calculus of variations, two hours; Seminar, two hours.—By Professor P. KOEBE: Analytic geometry of space and determinants, with exercises, five hours; Theory of functions, II, two hours; The problem of space, one hour.—By Dr. G. KÖNIG: Introduction to the theory of numbers, II, two hours; Exercises in mechanics, two hours; Exercises in descriptive geometry, two hours.

UNIVERSITY OF MUNICH.—By Professor A. PRINGSHEIM: Algebra, four hours; Theory of functions, four hours.—By Professor F. LINDEMANN: Foundations of geometry, two hours; Plane analytic geometry, four hours; Analytic mechanics, four hours; Seminar.—By Professor A. VOSS: Theory of algebraic curves, three hours; Differential calculus, four hours; Seminar.—By Professor H. BRUNN: Elements of higher mathematics and descriptive geometry, four hours.—By Professor G. HARTOGS: Differential calculus, two hours; Integral calculus, four hours; Exercises, one hour.—By Dr. K. BÖHM: Theory of integral equations, two hours; Statistics, two hours; Life insurance, four hours.

UNIVERSITY OF STRASSBURG.—By Professor H. WEBER: Calculus, four hours; Elliptic functions, two hours; Geometry of numbers, one hour; Seminar.—By Professor F. SCHUR: Projective geometry, four hours; Foundations of geometry, two hours; Seminar.—By Professor J. WELLSTEIN: Algebraic functions and their integrals, four hours; Riemann surfaces, two hours.—By Professor R. v. MISES: Analytic geometry, four hours; Integral equations, two hours; Seminar.—By Professor P. EPSTEIN: Theory of numbers, three hours.—By

Professor M. SIMON: History of mathematics in antiquity, three hours.—By Dr. A. SPEISER: Differential equations and transformation groups, two hours.

THE following advanced courses in mathematics are offered at the Italian universities during the academic year 1912–1913. Courses in algebra, analytic geometry, projective and descriptive geometry, and elementary courses in the calculus, mechanics, astronomy, and geodesy are not included:

UNIVERSITY OF BOLOGNA.—By Professor P. BURGATTI: Troubled motion of the planets, classical and modern theories, three hours.—By Professor L. DONATI: Thermodynamics and its correlations to the electrodynamics of moving bodies, three hours.—By Professor F. ENRIQUES: Theory of algebraic functions, three hours.—By Professor S. PINCHERLE: Advanced calculus, elementary theory of integral equations, three hours.

UNIVERSITY OF CATANIA.—By Professor M. DEFRANCHIS: Hyperelliptic surfaces, four hours.—By Professor G. LAURICELLA: Orthogonal functions, applications to developments and integral equations, three hours.—By Professor G. PENNACCHIETTI: Elliptic functions with particular regard to their applications in mechanics, four hours.—By Professor C. SEVERINI: Integral equations, four hours.

UNIVERSITY OF GENOA.—By Professor E. E. LEVI: Differential equations, four hours.—By Professor G. LORIA: Differential geometry of curves and surfaces, three hours.—By Professor O. TEDONE: Acoustics, three hours.

UNIVERSITY OF NAPLES.—By Professor F. AMODEO: History of mathematics from Galileo to Newton, three hours.—By Professor A. DEL RE: General analysis of Grassmann with applications to geometry and mechanics, four and one-half hours.—By Professor G. GALLUCI: Theory of configurations, two hours.—By Professor R. MARCOLONGO: Theory of elasticity, vibrations of elastic bodies, elastic membranes, three hours.—By Professor D. MONTESANO: General theory of surfaces, surfaces of the third order, four and one-half hours; Geometry of the imaginary elements, three hours.—By Professor E. PASCAL: Riemann surfaces and functions on them, three hours.—By Professor L. PINTO: Propagation of heat, four and one-half hours.

UNIVERSITY OF PADUA.—By Professor F. D'ARCAIS: Functions of a complex variable with classical applications, four hours.—By Professor U. CISOTTI: Mathematical theory of elasticity with technical applications, three hours.—By Professor P. GAZZANIGA: Theory of numbers, three hours.—By Professor T. LEVI-CIVITA: Analytical mechanics with applications to thermodynamics and relativity, four and one-half hours.—By Professor G. RICCI; Potential theory with applications, four hours.—By Professor F. SEVERI: Non-euclidean geometry, four hours.—By Professor G. VERONESE: Principles of elementary geometry, three hours.

UNIVERSITY OF PALERMO.—By Professor G. BAGNERA: Theory of integral equations and their applications in analysis, three hours.—By Professor M. GEBBIA: Vector fields, theory of electricity and magnetism, four and one-half hours.—By Professor G. B. GUCCIA: General theory of algebraic curves and surfaces, four and one-half hours.—By Professor A. VENTURI: General and special perturbations of the planets, eulerian cycle and movements of the terrestrial pole, three hours.

UNIVERSITY OF PAVIA.—By Professor L. BERZOLARI: Differential geometry, three hours.—By Professor F. GERBALDI: Functions of a complex variable, elliptic functions, three hours.—By Professor G. VIVANTI: Theory of contact transformations, three hours.—By ————: Mathematical physics, three hours.

UNIVERSITY OF PISA.—By Professor E. BERTINI: Projective geometry of hyperspaces, three hours.—By Professor L. BIANCHI: Functions of a complex variable, elliptic functions, four and one-half hours.—By Professor U. DINI: Fourier series, development of an arbitrary function of a real variable in terms of the integrals of a linear differential equation of the second order, four and one-half hours.—By Professor G. A. MAGGI: Analytic dynamics, electronic theory of the electromagnetic field, four and one-half hours.—By Professor G. PIZZETTI: General spherical astronomy, determination of orbits, principles of the theory of perturbations, four and one-half hours.

UNIVERSITY OF ROME.—By Professor L. BISCONCINI: Geometrical applications of the calculus, three hours.—By

Professor G. CASTELNUOVO: Differential geometry, three hours. —By Professor V. VOLTERRA: Differential equations of mathematical physics, three hours; Functions which depend on other functions, with applications to mechanics, three hours.—By ————: Higher analysis, three hours.

UNIVERSITY OF TURIN.—By Professor T. BOGGIO: Hydrodynamics, three hours.—By Professor G. FUBINI: Euclidean and non-euclidean geometry, congruent partitions of plane and space, functions of a complex variable, automorphic functions, three hours.—By Professor G. SANNIA: Differential geometry, two hours.—By Professor C. SEGRE: Geometric entities connected with linear systems of curves and surfaces of the second order, three hours.—By Professor C. SOMIGLIANA: Theory of elasticity with applications, three hours.

THE Prussian academy of sciences has advanced M800 toward the preparation of a new edition of Poggendorff's biographisch-literarisches Lexikon.

THE Paris academy of sciences has awarded the Poncelet prize (2,000 fr.) in pure mathematics to Professor E. MAILLET, of the Ecole des Ponts et Chaussées, for his contributions to mathematics. The Francoeur prize (1,000 fr.) was awarded to the estate of the late Dr. E. LEMOINE for the totality of his work in mathematics.

DR. ALFRED ACKERMANN, senior member of the publishing house of B. G. Teubner, has presented the sum of M20,000 to the University of Leipzig, to establish the "Alfred Ackermann-Teubner memorial prize for the promotion of mathematical sciences," to be awarded under the following conditions.

(1) For the present a cash prize of M1000 shall be awarded in the year 1914, and at intervals of two years thereafter.

(2) The unused interest shall be applied to the original capital until it reaches M60000.

(3) If circumstances permit, the prize shall be awarded annually from that time, and may be increased to correspond to the income.

(4) The prize shall be awarded in the following subjects, as defined in the Encyklopädie, in sequence: 1, history,

philosophy, didactics and pedagogy; 2, arithmetic and algebra; 3, mechanics; 4, mathematical physics; 5, analysis; 6, astronomy and the theory of errors; 7, geometry; 8, applied mathematics.

(5) While not excluding others, German competitors are to be considered first.

PROFESSOR P. DUHEM, of the University of Bordeaux, has been elected a member of the royal institute of Venice.

PROFESSOR L. HEFFTER, of the University of Freiburg, has been elected to membership in the academy of sciences of Halle.

CAMBRIDGE University has conferred its honorary doctorate of science on Professor E. PICARD of the University of Paris.

PROFESSOR O. BOLZA, of the University of Freiburg, has been elected to membership in the academy of sciences of Halle.

THE Italian society of sciences (the forty) has awarded its gold medal to Professor E. ALMANSI, of the University of Pavia, for his researches in mechanics and mathematical physics.

PROFESSOR O. HENRICI, of the City and Guilds Engineering College, London, has retired from active service. In recognition of his association with the institution, a gold medal, to be known as the Henrici medal, will be awarded annually for proficiency in mathematics.

PROFESSOR E. ALMANSI, of the University of Pavia, has accepted a professorship of rational mechanics at the University of Rome.

S. P. PEÑALVER Y BACHILLER has been appointed professor of higher analysis in the University of Sevilla.

DR. J. KOUNOWSKI has been appointed docent in geometry at the Bohemian technical school at Prague.

DR. M. RYCHLIK has been appointed docent in mathematics at the Bohemian University of Prague.

PROFESSOR G. KOHN, of the University of Vienna, has been promoted to a full professorship of mathematics.

PROFESSOR S. FINSTERWALDER has been promoted to the professorship of descriptive geometry of the technical school of Munich, held by Professor L. Burmester, who has retired.

DR. A. N. WHITEHEAD has been appointed reader in geometry in University College, University of London.

DR. M. POWER, of the University of Dublin, has been appointed professor of mathematics at the University College of Galway.

PROFESSOR E. T. WHITTAKER has been called to the University of Edinburgh to succeed the late Professor G. Chrystal in the chair of mathematics.

MR. W. D. EVANS, lecturer in mathematics at Hartley College, has been appointed Richardson lecturer in mathematics at the University of Manchester.

AT the Bedford College for Women, Dr. H. B. HEYWOOD has been appointed an assistant lecturer in mathematics and Miss M. LONG has been appointed an assistant in mathematics.

DR. G. SCORZA, of the University of Palermo, has been appointed professor of projective and descriptive geometry at the University of Cagliari.

PROFESSOR K. DOEHLEMANN, of the University of Munich, has accepted a full professorship of mathematics at the technical school of Munich.

MR. C. L. LANG has been appointed professor of mathematics and physics at the College of Agriculture, University of Porto Rico.

THE formal ceremonies attending the opening of the Rice Institute, at Houston, Texas, will take place on October 10–12. The inaugural exercises will include courses of lectures by distinguished foreign scientists, in mathematics Professors BOREL and VOLTERRA. The following appointments have been made in the department of mathematics: Professor, President E. O. LOVETT; assistant professor, Dr. G. C. EVANS; research associate in applied mathematics, P. J. DANIELL, M.A. (Cambridge).

MR. E. P. R. DUVAL, of Princeton University, has been appointed assistant professor of mathematics in the University of Kansas.

PROFESSOR R. D. CARMICHAEL, of the University of Indiana, has been promoted to an associate professorship of mathematics.

AT Brown University Dr. R. G. D. RICHARDSON has been promoted to an associate professorship of mathematics.

DR. E. W. SHELDON has been promoted to the professorship of mathematics in the University of Alberta.

DR. W. M. SMITH, of Lafayette College, has been appointed assistant professor of mathematics in the University of Oregon.

MR. R. B. STONE has been appointed instructor in mathematics at Purdue University.

DR. E. T. BELL, of Columbia University, has been appointed instructor in mathematics at the University of Washington.

PROFESSOR O. D. KELLOGG, of the University of Missouri, is spending a half-year's leave of absence abroad.

PROFESSOR M. W. HASKELL, of the University of California, has received a half-year's leave of absence, which he will spend abroad.

PROFESSOR GUSTAVE LEGRAS, of the College of the City of New York, died July 25 at the age of fifty-four years. He had been associate professor of mathematics in the College since 1884, and was one of the earliest members of the American Mathematical Society, having entered in December, 1889.

PROFESSOR E. L. RICHARDS, emeritus professor of mathematics in Yale University since 1906, died August 6 at the age of 74 years.

THE death is announced of Professor J. L. PTAŠICKIJ, professor of mathematics at the University of St. Petersburg.

PROFESSOR K. v. DER MÜHLL, of the University of Basel, died May 8, at the age of 70 years. He had been an associate editor of the *Mathematische Annalen* since 1873.

PROFESSOR J. HENRI POINCARÉ, of the University of Paris, died July 17, 1912, from an embolism after a two weeks' illness. He was born in Nancy, April 29, 1854, received the degree of doctor of science from the University of Paris in 1879, was elected to the academy of sciences in 1887, and to the French academy in 1908, besides holding membership in nearly all the learned societies of Europe. In 1885 he was awarded the Poncelet prize, and in 1896 the Reynaud prize, both by the academy of sciences of Paris; moreover, he received the King Oscar II prize in 1889, the gold medal of the royal astronomical society in 1900, the Sylvester medal in 1901, the Lobachevsky prize in 1904, the first award of the Bolyai prize in 1905, and the gold medal of the French association for the advancement of science in 1909. Regarding his contributions to the theory of functions, to the foundations of geometry, to the theory of relativity, and his influence in mathematical thought in general, appropriate mention will be made in another place.

CATALOGUE of second hand mathematical books: Mayer & Muller, Prinz Louis Ferdinand Strasse 2, Berlin, catalogue 268, about 3000 titles.