NOTES.

THE April number of the *Transactions of the American Mathematical Society* contains the following papers: "On multi-form solutions of linear differential equations having elliptic function coefficients," by W. L. MISER; "On the foundations of plane analysis situs," by R. L. MOORE; "On the generalized Jacobi-Kummer cyclotomic function," by H. H. MITCHELL; "Proof of a theorem of Haskins," by D. JACKSON; "On the measurable bounds and the distribution of functional values of summable functions," by C. N. HASKINS; "Jacobi's condition for problems of the calculus of variations in parametric form," by G. A. BLISS.

THE twenty-first summer meeting and eighth colloquium of the American Mathematical Society will be held at Harvard University during the week beginning Monday, September 4, 1916. The first two days will be devoted to the regular sessions for the presentation of papers. The colloquium will open on Wednesday morning and close on Saturday morning. Two courses of five lectures each will be given as follows (the list of principal topics is appended):

PROFESSOR G. C. EVANS: "Topics from the theory and applications of functionals, including integral equations."

The lectures will attempt a brief survey of the present state of this theory, showing how its results have been applied in various branches of analysis and in physics. The following topics will be considered, with the purpose of keeping the point of view as general as possible:

Functions depending on curves and surfaces in three dimensions, determination of Green's function by means of variational equations; functions depending on curves and surfaces in four dimensions, integrals of analytic functions of two complex variables; the linear functional relation, the integral equation of the third kind; applications of the Volterra theory of functional relations; applications of the Hilbert theory of integral equations.

PROFESSOR OSWALD VEBLEN: "Analysis situs."

This course will attempt to give an account of the present state of this elementary but relatively undeveloped branch of geometry. Among the topics considered will be:

The n-dimensional cell; separation of a cell into regions by polyhedra; combinatorial properties of polyhedra; manifolds as generalized polyhedra; abstract equivalence of manifolds; numerical invariants and group of a manifold; equivalence of two manifolds within a third, theory of knots; continuous transformations of a manifold into itself.

The chief references can be obtained from the article on Analysis Situs in the Encyklopädie and the chapter on Topology in the new edition of Pascal's Repertorium.

AT the meeting of the London mathematical society held March 9 the following papers were read: By P. A. MACMAHON: "Some applications of general theorems of combinatory analysis"; by H. F. BAKER: "Mr. Grace's theorem on six lines with a common transversal"; by H. E. J. CURZON: "The integrals of a certain Riccati equation connected with Halphen's transformation"; by HILDA P. HUDSON: "A certain plane sextic"; by W. P. MILNE: "The construction of co-apolar triads on a cubic curve"; by J. BONDMAN: "The dynamical equations of the tides."

AT the meeting of the Edinburgh mathematical society on March 10 the following papers were read: By J. F. TINTO: "Transformations founded on the space cubic and its chord system"; by J. DOUGALL: "Elliptic cylindrical harmonics."

THE Association of mathematics teachers of New Jersey held its fourth regular meeting at Princeton University on May 6, 1916. The programme included the presidential address of Professor H. B. FINE: "The theory of incommensurable magnitudes as set forth in the tenth book of Euclid's Elements;" Report of the committee on trigonometry courses; EDWIN FLORANCE: "Ptolemy's theorem;" E. S. INGHAM: "An exposition of Napier's principle of logarithms;" Rev. F. C. DOAN: "Certain religious implications of the mathematical infinite;" J. C. STONE: "The ultimate aim of a course in arithmetic."

THE Paris academy of sciences announces as the subject for its Grand prize in mathematics (3000 francs) for 1917 the following:

"To perfect in an important point the theory of successive

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powers of a given substitution, the exponent of the power increasing indefinitely. The influence of the initial element is to be considered, and the consideration may be limited to the simplest cases, such as that of rational substitutions in one variable."

The Academy has elected as corresponding members Professors LIAPOUNOF, of Petrograd, and C. J. DE LA VALLEÉ POUSSIN, of Louvain.

ON account of the war two mathematical periodicals have suspended publication, viz., *L'Education Mathématique*, which concluded its sixteenth and last volume with the issue for July, 1914, and the *Revue de Mathématiques Spéciales*, last issued in September, 1914, in completion of its twenty-fourth consecutive year.

THE following university courses in mathematics are announced for the academic year 1916–1917:

CORNELL UNIVERSITY.—By Professor J. MCMAHON: Theory of probabilities, three hours.—By Professor V. SNYDER: Descriptive geometry (first term), three hours; Algebraic curves and surfaces, three hours.—By Professor F. R. SHARPE: Theory of potential and Fourier series, three hours.—By Professor W. B. CARVER: Differential geometry (first term), three hours; Theory of numbers (second term), three hours. —By Professor A. RANUM: Modern algebra (second term), three hours.—By Professor D. C. GILLESPIE: Principles of mechanics, three hours.—By Professor W. A. HURWITZ: Theory of functions of real variables, three hours.—By Professor C. F. CRAIG: Functions of a complex variable, three hours.—By Professor F. W. OWENS: Differential equations, three hours; Mathematical physics, three hours.—By Dr. J. V. MCKELVEY: Advanced calculus, three hours.—By Dr. L. L. SILVERMAN: Analytic geometry, three hours.—By Dr. M. G. GABA: Projective geometry, three hours.—By Mr. H. BETZ: Graphical processes and numerical calculation, three hours.

HARVARD UNIVERSITY.—All courses meet three times a week throughout the year, except those marked*, which meet for half a year.—By Professor W. F. OSGOOD: Introduction to potential functions and Laplace's equation;* Galois's theory

of equations.*—By Professor M. Bôcher: Interpolation and approximation;* Theory of functions; Linear differential equations, complex variables.*—By Professor C. L. Bouton: Advanced calculus; Geometrical transformations, with special reference to the work of Sophus Lie.—By Professor J. L. Coolidge: Modern geometry and modern algebra; Line geometry.—By Professor E. V. Huntington: Fundamental concepts of mathematics.*—By Professor G. D. Birkhoff: Dynamics, second course;* Analytical theory of heat, Fourier's series, and Legendre's polynomials;* Applications of the calculus of variations.*—By Professor D. Jackson: Infinite series and products;* Lebesgue integrals.*—By Dr. G. M. Green: Elementary differential equations;* Differential geometry of curves and surfaces.—By Dr. E. Kircher: Vector analysis;* Finite groups.*—By Mr. W. LeR. Hart: Calculus of variations;* Functions of infinitely many variables.*

Professors Osgood and Birkhoff will conduct a fortnightly seminar in analysis.

Courses of research are also offered by Professor Osgood in the theory of functions, by Professor Bôcher in the real solutions of linear differential equations, by Professor Bouton in the theory of point-transformations, by Professor Coolidge in geometry, by Professor Birkhoff in the theory of differential equations, by Professor Jackson in the theory of functions of a real variable, and by Dr. Green in differential geometry.

University of Pennsylvania.—By Professor E. S. Crawley: Modern analytic geometry.—By Professor G. E. Fisher: Theory of functions of a complex variable.—By Professor G. H. Hallett: Galois theory of equations.—By Professor F. H. Safford: Partial differential equations.—By Professor M. J. Babb: Introduction to modern higher algebra.—By Professor O. E. Glenn: Theory of invariants.—By Professor H. H. Mitchell: Elliptic functions.—By Dr. R. L. Moore: Functions of a real variable with an introduction to certain phases of general analysis.—By Dr. F. W. Beal: Differential geometry.

Princeton University (1916–1917).—By Professor H. B. Fine: History of analysis, second term, three hours.—By Professor L. P. Eisenhart: Differential geometry, three hours.—By Professor Oswald Veblen: Projective geometry,

three hours; Seminar.—By Professor PIERRE BOUTROUX: Analysis, three hours; Differential equations, three hours.— By Dr. A. A. BENNETT: Algebra, three hours; Projective geometry, three hours.—By Dr. J. W. ALEXANDER: Newtonian potential function, three hours.

SHELDON travelling fellowships for the year 1916–1917 have been awarded by Harvard University to Mr. R. W. BRINK and Mr. J. L. WALSH. During the current academic year a similar fellowship is held by Mr. L. R. FORD, who is studying in Paris. Mr. A. L. MILLER holds a Rogers travelling fellow-ship and is studying in Turin.

ONE of the two fellowships, of the annual value of seven hundred and fifty dollars, in the department of mathematics of the Rice Institute remains to be filled for the academic year 1916–1917. The successful candidate will be expected to enter upon a course of study and research work leading to the degree of doctor of philosophy, and also to assist with elementary teaching of mathematics for six hours per week. The fellows will be able to live in the residential hall of the Institute, where board and lodging will be provided for them at about thirty dollars per month. Applications accompanied by testi-monials and a full statement of previous work and training should be addressed to the Department of Mathematics, Rice Institute, Houston, Texas.

ON March 16, 1916, the Scandinavian mathematicians cele-brated at Stockholm the seventieth birthday of their illustrious colleague, Professor G. MITTAG-LEFFLER, founder and director of the *Acta Mathematica*. Many messages of congratulation were received from mathematicians of other countries. On this occasion Professor Mittag-Leffler and his wife set aside their entire fortune for the foundation of an International in-stitute for pure mathematics.

MR. R. E. GILLMAN, of Princeton University, has been ap-pointed instructor in mathematics at Cornell University.