Outlines of Certain Fields of Research:

(*a*) "Foundations of geometry," by Professor Oswald Veblen, Princeton University.

(*b*) "Calculus of variations," by Professor G. A. Bliss, University of Chicago.

(It is frequently urged that college and university teachers should be engaged in some form of productive work, but many college instructors do not know promising lines of investigation and do not know how and where to find the literature which will inform them what has already been done in various lines. A suggestion has been made that the Association can do a valuable service if on its programs and through the *American Mathematical Monthly* university teachers map out for college teachers possible lines of research growing readily out of college courses. These papers afford a beginning of such suggestions.)

"Courses in mechanics for students majoring in mathematics," by Professor E. V. Huntington, Harvard University.

"Topology of three-dimensional manifolds in three dimensions," by Professor Norman Miller, Queen's University.

"Functionality in mathematical instruction in schools and colleges," by Professor E. R. Hedrick, University of Missouri.

"An example in the inversion of upper limits and bounds," by Professor Samuel Beatty, University of Toronto.

"New mathematical periodicals," by Professor G. A. Miller, University of Illinois.

"Proof of the fundamental theorem regarding the length of a curve," Professor J. L. Synge, University of Toronto, by invitation.

At the business meeting the following officers for 1922 were elected:

President: R. C. Archibald, Brown University.

Vice-presidents: R. D. Carmichael, University of Illinois, and B. F. Finkel, Drury College.

Trustees: L. P. Eisenhart, Princeton University; E. V. Huntington, Harvard University; D. N. Lehmer, University of California; G. A. Miller, University of Illinois; E. J. Wilczynski, University of Chicago.

The trustees elected to membership 58 individual members and 4 institutional members.

The financial report indicated an estimated surplus of $240 on the year's business.

The full proceedings of the meeting were published in the *Monthly* for March, 1922.

W. D. CAIRNS,
Secretary-Treasurer

THE AMERICAN MATHEMATICAL SOCIETY

THE twenty-eighth annual meeting of the society and the forty-eighth regular meeting of the Chicago section were held at the University of Toronto on Wednesday and Thursday, December 28-29, in affiliation with the meetings of the American Association for the Advancement of Science. The regular sessions of the society were held on Wednesday, President Bliss occupying the chair, relieved by Professors P. F. Smith and C. N. Haskins. On Thursday morning there was held a joint session with Sections B and C of the American Association and the American Physical Society, and on Thursday afternoon a joint session with Section A and the Mathematical Association of America. The attendance included 84 members. At the meeting of the council on Wednesday, 61 persons were elected to membership in the society.

At the annual election the following officers and other members of the Council were chosen: *Vice-presidents,* R. D. Carmichael and D. E. Smith; *secretary,* R. G. D. Richardson; *treasurer,* W. B. Fite; *librarian,* R. C. Archibald; *committee of publication,* E. R. Hedrick, W. A. Hurwitz, J. W. Young; *members of the Council,* to serve until December, 1924, J. W. Alexander, Henry Blumberg, L. L. Dines, F. R. Sharpe.

The total membership of the society is now 1,005, including 85 life members. The total attendance of members at all meetings, including sectional meetings, during the past year was 420; the number of papers read was 175. At the annual election 169 votes were cast. The treasurer's report shows a balance of $10,604.22, including the life membership fund of $7,528.87. Sales of the society's publications during the year amounted to $3,222.16. The library now contains 6,014 volumes, excluding 500 unbound dissertations.

The program of the joint session of Thursday morning was as follows:

I. Atomic nuclei and extra-nuclear electronic configuration, by Professor J. C. McLennan, retiring vice-president of Section B.

II. Symposium on quantum theory: for Section C, Dr. R. C. Tolman; for the American Mathematical Society, Professor H. B. Phillips; for

the American Physical Society, Dr. Saul Dushman.

The joint session on Thursday afternoon has already been reported under Section A.

The following papers were read at the regular sessions of the society:

Differential geometry of an m-dimensional manifold in a euclidean space of n dimensions: C. E. Wilder.

Differential geometry of an m-dimensional manifold in a euclidean space of n dimensions. Second paper: C. E. Wilder.

A modification of Peano's postulates for positive integers: M. H. Ingraham.

Riemann geometry and its generalizations: L. P. Eisenhart and Oswald Veblen.

The problem of apportionment. The method of the weighted geometric mean: R. W. Burgess.

Necessary and sufficient conditions in the problem of apportionment: E. V. Huntington.

Commutativity of contact transformations of mechanics: S. D. Zeldin.

Substitutions which are commutative with every substitution of an intransitive group: G. A. Miller.

Seeming contradictions in the theory of groups: G. A. Miller.

Convergence-factors in Cesàro-summable series: W. A. Hurwitz.

Note on the determination of the rectilinear secular trend of an ordered series of statistical relatives: W. L. Crum.

Provisions for depreciation based directly upon appraisal: C. H. Forsyth.

Plane algebraic curves invariant under a given quadratic Cremona transformation: Arnold Emch.

Canonical systems and the general problem of dynamics: Joseph Lipka.

Euler squares: H. F. MacNeish.

The expression of general forms as determinants whose elements are forms. Preliminary report: H. S. Everett.

The arithmetic mean of the least and greatest of n measurements: E. L. Dodd.

Convex distribution of the zeros of Sturm-Liouville functions: Einar Hille.

On Kellogg's diophantine problem: D. R. Curtiss.

The isodyadic quintic equation: J. S. C. Glashan.

On the isodyadic septimic equation: J. S. C. Glashan.

Criteria for relative root distributions: C. F. Gummer.

The algebraic theory of algebraic functions: Samuel Beatty.

An algebraic proof of the existence of the branches of an algebraic function: I. R. Pounder.

On the determinant of an hermitian matrix of quaternionic elements: E. H. Moore.

Some properties of the surfaces which represent the real and imaginary components of a function of a complex variable: E. J. Wilczynski.

Note on differential invariants: O. E. Glenn.

Hesse's associated points and the Weddle surface: Louise D. Cummings.

Some of the principles of the operation with series applied to a partial fraction problem: I. J. Schwatt.

Expansion of powers of infinite series: I. J. Schwatt.

A symbolic theory of formal modular invariants: Olive C. Hazlett.

The equivalence of expansions in orthogonal functions: Norbert Wiener and J. L. Walsh.

The next meeting of the society was held in New York City on February 25, this being the only meeting held in New York during the spring.

R. G. D. RICHARDSON,
Secretary

THE two hundred and twenty-second regular meeting of the American Mathematical Society, being the seventeenth regular Western meeting, and the forty-ninth regular meeting of the Chicago Section, was held at the University of Chicago on Friday and Saturday, April 14 and 15, 1922, in honor of the twenty-fifth anniversary of the Chicago Section. The attendance at these meetings was approximately one hundred and fifty, and included one hundred and four members of the society.

At the meeting of the council, ten persons were elected to membership in the society. Professor A. B. Coble was reelected a member of the editorial committee of the *Transactions* for a term of three years, beginning October 1, 1922.

The council accepted for the society the trust of the Eliakim Hastings Moore Fund, tendered through Professor Arnold Dresden, chairman of the committee that had collected the fund; this fund is to be used for the publication of mathematical books and memoirs, and the award of prizes. In this connection a pleasant feature was the presentation at the dinner on Friday evening of a testimonial to Professor Moore from his former students and

fellow-members of the Chicago Section. A more detailed account of this testimonial and of the establishment and purposes of this fund has appeared in SCIENCE.

The session on Friday afternoon was devoted to a symposium lecture by Professor A. B. Coble, on "Cremona transformations and applications to algebra, geometry and modular functions," followed by questions and discussion. The following papers were read at the other sessions of the society, those of Professors Dresden, Shaw and E. H. Moore being by request:

Abstract definitions of the symmetric and alternating groups and certain other permutation groups: R. D. CARMICHAEL.

On the zeros of successive polars of a binary form: D. R. CURTISS.

Relations between kindred P and Q functions: D. R. CURTISS.

On the equivalence of the Cesàro and Hölder means for multiple limits: C. N. MOORE.

On convergence factors in triple series and the triple Fourier series: BESS M. EVERSULL.

Independent sets of coaxial minors of determinants: E. B. STOUFFER.

On the minimizing of a class of definite integrals: P. R. RIDER.

On the approximate representation of periodic functions of two variables: ELIZABETH CARLSON.

Substitution groups whose cycles of the same order contain a given number of letters: G. A. MILLER.

Conformal transformations of linear homogeneous difference equations and their invariants: S. D. ZELDIN.

A new form of integral expansion: NORBERT WIENER.

Note on certain semi-invariants of n-lines: LENNIE P. COPELAND.

Residues of figurate numbers: O. E. GLENN.

Inter-variate correlation and the successive measures of dispersion in an ordered statistical series: W. L. CRUM.

Inter-variate partial regression equations in an ordered statistical series: W. L. CRUM.

Concerning relatively uniform convergence: R. L. MOORE.

On the cut-points of continuous curves and of other connected point sets in space of two dimensions: R. L. MOORE.

A solution of a spinning oblate spheroid two-body problem: F. E. CARR.

The elliptic modular functions associated with the elliptic norm curve E^7: ROSCOE WOODS.

Die Zerlegung von Primzahlen in algebraischen Zahlkörpern: ANDREAS SPEISER.

A boundary value problem in the calculus of variations: G. A. BLISS.

Certain generalizations of osculatory interpolation: J. F. REILLY.

A survey of the scientific work of the Chicago Section, 1899-1922: ARNOLD DRESDEN.

On functional transformations: J. B. SHAW.

On the determinant of a hermitian matrix of quaternionic elements. Definition and elementary properties with applications: E. H. MOORE.

Trigonometric expansion of aperiodic functions: T. C. FRY.

Mathematical paradoxes involved in the new Bucyrus gasoline shovel: R. S. HOAR.

On permutable quadratic forms in infinitely many variables: E. W. CHITTENDEN.

A fundamental system of invariants of a modular group of transformations: J. S. TURNER.

Note on a generalization of the strophoid: F. H. HODGE.

Ruled surfaces of Green-reciprocal correspondences: E. P. LANE.

The Laplace-Poisson mixed equation: K. P. WILLIAMS.

A criterion from integral equations relating to the existence of solutions for the one-dimensional boundary value problem: H. T. DAVIS.

A general criterion relating to the existence of solutions for the one-dimensional boundary value problem: H. T. DAVIS.

A continuous curve in the rôle of a space: R. L. WILDER.

Continuous transformations in analysis situs: N. J. LENNES.

On the foundation of the theory of sets: N. J. LENNES.

An error in the theory of differential equations by Lie's method: L. E. DICKSON.

Present status of the history of the theory of numbers: L. E. DICKSON.

The determination of a seasonal variation: W. L. HART.

Concerning compact Kürschák fields: V. D. GOKHALE.

A second mechanism for illustrating lines of force: W. H. ROEVER.

R. G. D. RICHARDSON,
Secretary