# BULLETIN

## OF THE

# AMERICAN MATHEMATICAL SOCIETY

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## THE INTERNATIONAL CONGRESS AT TORONTO*

The seventh International Mathematical Congress was opened on Monday morning, August 11, 1924, in the Convocation Hall of the University of Toronto by Professor Ch. de la Vallée Poussin, President of the International Mathematical Union. Addresses of welcome were delivered by the Honorable H. S. Beland on behalf of the Government of the Dominion, and by Sir Robert Falconer, President of the University of Toronto. At this session, Professor J. C. Fields was elected President of the Congress; Vice-Presidents were appointed for the sessions of the Congress, which were to be held in eight sections as follows:

SECTION    I.    Algebra, Theory of Numbers, Analysis.
SECTION   II.    Geometry.
SECTION  III.    (a) Mechanics, Mathematical Physics.
SECTION  III.    (b) Astronomy, Geophysics.
SECTION   IV.    (a) Electrical, Mechanical, Civil and
                       Mining Engineering.
SECTION   IV.    (b) Aeronautics, Naval Architecture,
                       Ballistics, Radiotelegraphy.
SECTION    V.    Statistics, Actuarial Science, Economics.
SECTION   VI.    History, Philosophy, Didactics.

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These Sections began their meetings on Monday afternoon, and continued every morning throughout the week, with the exception of Thursday which was set aside for an all day excursion to Niagara Falls.

The afternoons and evenings were devoted to general lectures, and to social functions. The meetings of the British Association for the Advancement of Science which had started during the preceding week overlapped with the earlier sessions of the Congress, thus furnishing an opportunity for hearing many of the most eminent scientists in many fields.

Not enough praise can be given to the Committee on Entertainment, to the officials of the Province of Ontario, of the City of Toronto, and of the University, and to the citizens of Toronto, who provided lavish opportunity for social intercourse in the form of garden parties, a conversazione in Hart House, an excursion around the City of Toronto, etc.

On Saturday afternoon the Congress paid homage to the students of the University of Toronto who laid down their lives in the war. A wreath was placed in the newly erected Memorial Tower of the University; short addresses were made by Professor de la Vallée Poussin and by President Sir Robert Falconer; and it was announced that arrangements had been made for inserting in the wall of the Tower a medallion bearing the following inscription: "To the heroes of the University of Toronto, the members of the International Mathematical Congress, Toronto, 1924."

A special convocation of the University of Toronto was held on Wednesday afternoon. Honorary degrees were conferred upon Sir David Bruce, Sir Charles Parsons, Sir John Russell, Sir Ernest Rutherford of the British Association for the advancement of Science, and upon Professors F. Severi, Ch. de la Vallée Poussin, V. Stekloff and G. Koenigs of the International Mathematical Congress.

The general assembly of the International Mathematical Union took place on Friday morning. Of the six delegates elected by the American Section of the Union, Professors

Coble, Richardson, and Snyder were present.* Professor
S. Pincherle, of the University of Bologna, was elected
President of the Union for the ensuing quadrennium; Pro-
fessors G. Koenigs and A. Demoulin were reelected as Secre-
tary and Treasurer respectively. Professors G. A. Bliss,
E. Phragmen, and H. Fehr were elected as Vice-Presidents
in place of Professors Dickson, Larmor, and Volterra,
whose terms expired, while Professors P. Appell and W.
H. Young continue as Vice-Presidents. As Honorary Pre-
sidents of the Union were elected Professors L. E. Dickson,
J. C. Fields, H. Lamb, G. Mittag Leffler, Emile Picard,
Ch. de la Vallée Poussin, and V. Volterra.

A Committee on International Bibliography was appointed,
consisting of Professors Archibald, Bortolotti, Fréchet,
van der Woude, and W. H. Young.

The following announcement was made by the American
Section of the Union and received the endorsement of the
delegations from Italy, Holland, Sweden, Denmark, Norway,
and England.

"The American Section of the International Mathema-
tical Union has unanimously passed the following resolution
and requests that it be transmitted to the International
Research Council by the Executive Committee of the Inter-
national Mathematical Union:

"Resolved that the American Section of the International
Mathematical Union requests the International Research
Council to consider whether the time is ripe for the re-
moval of the restrictions on membership now imposed by
the rules of the Council.

"The American Section also wishes to announce that it
intends to present to the National Research Council of the
United States resolutions requesting action in this direction."

The closing session of the Congress took place on Satur-
day afternoon.

Professor Synge, Secretary of the Congress, announced

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* See this BULLETIN, vol. 30 (1924), p. 377.

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that 387 persons, representing 25 countries, had registered as members of the Congress, the distribution being as follows: Argentina 2, Belgium 7, Canada 67, Cuba 1, Czecho Slovakia 3, Denmark 3, France 26, Georgia 1, Great Britain 39, Holland 4, India 2, Ireland 3, Italy 11, Mexico 1, Norway 5, Poland 3, Portugal 2, Rumania 1, Russia 5, Spain 3, Sweden 3, Switzerland 4, Ukrania 1, United States 189, Yugo Slavia 1.

A resolution was unanimously adopted stating that the Congress hears with pleasure that the Royal Irish Academy contemplates the publication of a collected edition of the works of Sir William Rowan Hamilton.

Resolutions were also adopted expressing to the government of the Dominion, of the Province of Ontario, and of the City of Toronto, and to the many persons and organizations who had contributed to the success of the meeting the recognition and thanks of the Congress.

The number of papers read at the meetings of the various Sections reached the enormous total of 235. In addition to these, the following 7 lectures were given before general sessions of the Congress:

C. Störmer, *Modern Norwegian Researches on the Aurora Borealis.*

F. Severi, *Géométrie algébrique.*

E. Cartan, *La théorie des groupes et les recherches récentes de géométrie différentielle.*

W. H. Young, *Some characteristic features of twentieth century pure mathematical research.*

L. E. Dickson, *Outline of the theory to date of the arithmetics of algebras.*

S. Pincherle, *Opérations fonctionnelles.*

M. Le Roux, *Sur l'intégration des équations aux dérivées partielles par des intégrales définies.*

The following is a list, as nearly accurate as it has been possible to secure, of the papers presented at the sectional sessions.

Section I. W. Kapteyn, *Expansion of functions in terms of Bernoullian functions*; G. A. Bliss, *The transformation of Clebsch in the calculus of variations*; J. Ouspensky and B. Venkov, *On some new class number relations*; M. Plancherel, *Sur les séries de fonctions orthogonales*; P. A. MacMahon, *Some recent developments in determinant theory*; L. E. Dickson, *Further development of the theory of arithmetics of algebras*; G. Prasad, *On the numerical solution of integral equations*; O. E. Glenn, *Differential combinants and associated parameters*; J. A. Shohat (Jacques Chokhate), *On the asymptotic properties of a certain class of Tchebycheff polynomials*; B. A. Bernstein, *Modular representations of finite algebras*; N. Gunter, *Sur la résolution des systèmes des équations* Grad $X = A$ Rot $X = A$; F. H. Murray, *The asymptotic distribution of the characteristic numbers for the self-adjoint linear partial differential equations of the second order*; J. F. Ritt, *Elementary functions and their inverses*; Th. Varopoulos, *Sur les valeurs exceptionnelles des fonctions multiformes*; L. Pomey, *Les équations intégro-différentielles à plusieurs variables*; O. Öre, *A new method in the theory of algebraic numbers*; H. S. Vandiver, *On the first case of Fermat's last theorem*; R. Birkeland, *On the solution of quintic equations*; W. L. G. Williams. *Formal modular invariants of forms in several variables*; J. Wolff, *On the sufficient conditions for analyticity*; E. T. Bell, *General class number relations whose degenerates involve indefinite forms*; O. E. Glenn, *The method of invariant elements in a modular field*; N. Kryloff, *Sur quelques recherches dans le domaine de la théorie de l'interpolation et des quadratures dites mécaniques*; N. Kryloff and T. Tamarkine, *Sur une formule d'interpolation*; J. Touchard, *Sur la théorie des différences*; J. Touchard, *Sur certaines équations fonctionelles*; J. I. Del Corrail, *Meditations on trigonometry*; A. Lévy, *Sur le calcul des idéaux d'un corps du second degré*; M. Petrovitch, *Correspondance entre la fonction et la fraction décimale*; L. E. Dickson, *A new theory of linear transformations and pairs of bilinear forms*; L. Pomey, *La théorie des nombres*; D. R. Curtiss, *Rational processes for separating the real branches of a plane curve at a multiple point*; T. R. Rosebrugh, *A theorem on the moduli of substitutions involving products of variables themselves given by linear substitutions*; N. Gunter, *Sur un problème fondamental de la hydrodynamique*; E. Narishkina, *On the analogs of Bernoullian numbers in quadratic fields*; J. Drach, *Sur "l'intégration logique" des équations différentielles de la géométrie et de la mécanique*; L. Crelier, *Sur les équations intégrales simples*; E. Hille, *On the zeros of functions defined by linear differential equations*; R. Fueter, *Some applications of the theory of functions to the theory of numbers*; G. C. Evans, *The Dirichlet problem for the general finitely connected open region*; A. Razmadze, *Sur quelques formules de la moyenne*; G. A. Miller, *Commutative conjugate cycles in subgroups of*

*the holomorph of an Abelian group*; W. Sierpinski, *Les ensembles bien
définis non mesurables*; V. Stekloff, *Sur les problèmes de représentation
approchée des fonctions à l'aide des polynomes, du calcul approché des
intégrales définies, du développement des fonctions en séries de poly-
nomes et de l'interpolation, considérés au point de vue des idées de
Tchebycheff*; J. C. Fields, *A basis for the theory of ideals*; B. Delaunay,
*Sur le nombre de représentations d'un nombre par une forme binaire
cubique d'un discriminant négatif*; R. L. Wilder, *On a certain type
of connected set which cuts the plane*; J. I. Hutchinson, *On the roots
of the Riemann zeta function*; W. B. Ford, *On determining the
asymptotic developments of a given function*; L. Tonelli, *Sul calcolo
delle variazioni*; A. Razmadze, *Sur les extrémales discontinues dans le
calcul des variations*; L. G. Du Pasquier, *L'évolution du concept du
nombre hypercomplexe entier*; T. Andrade, *Problème proposé sur les
équations fonctionnelles*; O. C. Hazlett, *On the arithmetic of a general
associative algebra*; M. Kossler, *A generalization of the theorems of
Fabry and Szasz*; M. Kravtschok, *Note sur l'interpolation généralisée.*

Section II. C. Servais, *Sur les lignes asymptotiques*; E. Cartan,
*Sur la déformation projective des surfaces*; A. B. Coble, *The behavior
of the rational plane sextic and its related Cayley symmetroid under
regular Cremona transformation*; T. Bonnesen, *Recherches géométriques
sur le problème isopérimétrique*; J. H. Weaver, *On a system of triangles
related to a poristic system*; J. A. Barrau, *Conditions of intersection
of flat spaces situated in a quadratic variety*; F. Morley, *The con-
dition that the curves of a net have a common point*; M. Fréchet,
*Expression la plus générale de la "distance" sur une droite*; G. Fubini,
*Principles of projective differential geometry*; A. R. Da Costa, *L'en-
seignement des mathématiques doit être orienté pour l'étude de la rela-
tivité*; A. Naess, *On a method of generalizing the vector products to
$S_m$*; A. Naess, *Three theorems of analysis derived by the vector method
as corollaries from a single proposition*; F. D. Murnaghan, *The gene-
ralized Kronecker symbol*; N. Delaunay, *Sur les bases nouvelles de la
théorie des systèmes articulés*; G. Tzitzeica, *Un nouveau problème sur
les suites de Laplace*; M. Fréchet, *Sur une représentation paramétrique
intrinsèque de la courbe continue la plus générale*; C. H. Sisam, *On
surfaces whose asymptotic curves are cubics*; E. A. L. Merlin, *Sur les
réseaux asymptotiques*; B. Delaunay, *Sur la sphère vide*; M. Janet,
*Sur les systèmes linéaires d'hypersurfaces*; G. Koenigs, *Sur les mouve-
ments à deux paramètres doublement décomposables*; C. Servais, *Sur la
géométrie du tétraèdre*; N. B. MacLean, *On certain surfaces related
covariantly to a given ruled surface*; L. A. Godeaux, *Sur les involutions
régulières d'ordre deux appartenant à une surface irrégulière*; C. T.
Sullivan, *The determination of all surfaces characterized by a redu-
cible directrix quadric*; A. Errera, *Quelques remarques sur le problème*

*des quatre couleurs*; J. A. Eiesland, *Quadratic flat-complexes in odd N-space and their singular spreads. Flat sphere transformation*; J. L. Synge, *Normals and curvatures of a curve in a Riemannian manifold*; B. Bydzovsky, *Contribution à la théorie de la sextique à huit points doubles*; A. Torroje, *Sur la représentation des espaces pluri-dimensionnels*; M. W. Haskell, *Curves autopolar with respect to a finite number of conics*; D'A. W. Thompson, *The repeating patterns of the regular polygons and their relation to the Archimedean bodies*; A. H. Wheeler, *New methods for constructing geometry models*; L. D. Cummings, *Cyclic systems of six points in a binary correspondence*; W. van der Woude, *On the finiteness of a system of invariants*; M. Fréchet, *Number of dimensions of an abstract set*; A. Demoulin, *La théorie des équations M et quelques unes de ses applications à la géométrie*; C. Ricci, *Contributo alla teoria delle varietà Riemanniane*; E. Bortolotti, *L'algebra geometrica ed i prodromi della geometria analytica in un manuscritto inedito de R. Bombelli*; J. Pierpont, *Non-euclidean geometry from a non-projective standpoint*.

Section III. S. Zaremba, *Sur un groupe de transformations qui se présente en électrodynamique*; W. F. G. Swann, *A new deduction of the electromagnetic equations*; P. Haag, *Sur un problème général de probabilités et ses diverses applications*; C. V. Raman, *Theory of the structure of liquid surfaces*; E. W. Brown, *The orbit of the eighth satellite of Jupiter*; L. Silberstein, *A finite world radius and some of its cosmological implications*; S. Chapman, *Steps towards a new theory of magnetic storms*; R. H. Fowler, *The equilibrium properties of gases at high (stellar) temperatures*; C. Snow, *Alternating current distribution in cylindrical conductors*; A. W. Conway, *On the quantisation of certain orbits*; P. Haag, *Sur l'application des méthodes du calcul tensoriel à la théorie des moindres carrés*; G. Greenhill, *The spinning top in two moves*; G. Giorgi, *The functional dependence of physical variables*; A. C. Dixon, *A rectangular plate, clamped at edges*; J. Gianfrancheschi, *The perturbations in electrons' orbits*; H. M. Dadourian, *On the fundamental principle of dynamics*; S. J. Jacobsohn, *Note on the force equation of electrodynamics*; W. J. Humphreys, *The effect of surface drag on surface winds*; G. F. McEwen, *Calculation of the velocity of vertical ocean currents in the San Diego region from the accompanying temperature reduction below "normal" values*; A. H. S. Gillson, *The dynamical theory of tides in an ocean of varying depth*; N. H. Heck, *Velocity of sound in sea water*; D. Buchanan, *Asymptotic solutions in the problem of three bodies*; J. Patterson, *The theory of the anemometer*; H. C. Plummer, *Note on the reduction of parallax plates*; P. Haag, *Sur le problème des séquences*; L. V. King, *On the direct numerical calculation of elliptic functions and integrals*; D. Wrinch, *A subject in hydrodynamics*; S. Chapman, *The electrostatic*

*potential energy of crystals of the calcite type*; A. W. Conway, *The mathematical work of Sir W. R. Hamilton*; G. A. Campbell, *A system of "definitive units" proposed for universal use*; A. Bezikovitch, *Über relative Maxima des Newtonschen Potentials*; C. de Losada Y Puga, *A short contribution to the kinetic theory of gases*; R. Risser, *Note au sujet des ondes d'émersion*; V. Kostitzin, *Sur une application des équations intégrales au problème d'hysterésis magnétique*; J. G. Gray, *Gyroscopic tops*; A. S. Eddington, *Absolute rotation*; E. Cartan, *La stabilité ordinaire des ellipsoides de Jacobi*; V. Stekloff, *Sur les recherches posthumes de Liapounoff sur les figures d'équilibre d'une liquide hétérogène en rotation*; C. E. St. John, *The red shift of the solar lines and relativity*; H. C. Levinson, *The gravitational field of n moving particles in the theory of relativity*; L. Silberstein, *Modern photographic theory*; J. Andrade, *Chronométrie: Problème actuel des horloges élastiques*; J. Andrade, *Balances spirales: Frictions hydrostatiques et viscosités*; Da Costa Lobo, *Nouvelles théories physiques: application à l'astronomie*; V. Bjerknes, *Solved and unsolved problems in dynamical meteorology*; N. Shaw, *The convective energy of saturated air in natural environment*; W. F. G. Swann, *A generalization of electro-dynamics consistent with restricted relativity and affording an explanation of the earth's magnetic and gravitational fields, and the maintenance of the earth's charge*; H. L. Vanderlinden, *The gravitational field of an electrical sphere with a variable density of matter*; L. A. Bauer, *The mathematical analysis of the earth's magnetic field*; J. Drach, *Sur le mouvement d'un solide pesant qui a un point fixe*; J. Chazy, *Sur l'arrivée dans le système solaire d'un astre étranger*; J. B. Pomey, *Sur la nature des grandeurs électriques considérées en électrostatique*; Barre, *Sur la propagation des ondes planes dans les milieux élastiques anisotropes*; H. Castro-Borel, *Sur quelques méthodes graphiques pour la détermination de la position géographique d'un dirigeable.*

Section IV. S. D. Carothers, *On the application of the principle of the elastic equivalence of statically equipollent loads to engineering problems*; A. P. M. Fleming and R. W. Bailey, *Mathematics in industrial research*; G. A. Campbell, *Mathematics in industrial research*; J. R. Carson, *A generalization of Rayleigh's reciprocal theorem*; E. Schou, *Sur quelques recherches aérodynamiques faites en Danemark avant 1900*; Marchis, *Development of aeronautics in France*; J. B. Henderson, *The oscillations of a gyroscopic compass comprising two gyroscopes*; A. Ferrier, *The duration and length of run required by a seaplane in taking off*; C. F. Jenkin, *What the engineer expects of the mathematician*; J. B. Henderson, *Mathematics for students of engineering*; J. B. Pomey, *Sur les nouveaux appareils multiplex de télégraphie*; U. Puppini, *Azioni sismiche sussultorie tra montanti verticali incastrati alla base con carichi e vincoli elastici all'estremo*

*superiore*; E. R. Hedrick, *Effects of variations in Hooke's law on impact, the theory of beams, and elasticity*; H. B. Dwight, *A new formula for use in calculating repulsion of coaxial coils*; T. R. Rosebrugh, *Calculation of long transmission systems*; J. A. L. Waddell, *Mathematics from a consulting engineer's viewpoint*; Charbonnier, *Sur la balistique extérieure*; V. Bjerknes, *On the forces which lift aeroplanes*; W. H. Roever, *Derivation of the differential equations of motion of a projectile regarded as a particle*; F. R. W. Hunt, *The choice of independent variable in the calculation of trajectories by small arcs*; T. R. Wilkins, *A method of computation for sound ranging data*; H. C. Plummer, *Design in gun construction*; W. F. Gerhardt, *New aerodynamical conceptions and formulae*; G. W. O. Howe, *A new theory of long distance radio communication*; N. Yamaga, *On the equilibrium of gases in the reaction of explosives*; G. Puppini, *Principe de réciprocité dans les sciences appliquées*; S. D. Carothers, *Test loads on foundations as affected by scale of tested area*; T. R. Rosebrugh, *The binary linear substitution of modulus unity in problems of general dynamics, acoustics and electricity*; E. G. Coker, *The teaching of the elementary theory of elasticity to engineering students*; R. W. Angus, *Arithmetic solution of engineering problems*; A. Boyajian, *Physical interpretation of complex angles and of their trigonometric functions*; A. E. Kennelly, *Hyperbolic-function series of integral numbers and the occasions for their presentation in electrical engineering*; R. M. Foster, *Two-mesh electric circuits realizing any specified driving-point impedance*; A. F. Samsioe, *Berechnung der Airyschen Spannungsfunktion für rechteckige Scheiben*; C. Parsons, *Physics and engineering*; B. P. Haigh and A. Beale, *Resonant vibration in steel bridges*; L. J. Briggs, *Research in mechanics and sound at the Bureau of Standards*; P. Cormack, *The use of exponentials in the analysis of machine motions*; L. Breguet, *Sur l'aviation*; M. Montoriel, *Sur les récents perfectionnements apportés à l'appareil Baudot*; Lesaffre, *Appareils Baudot présentés à l'exposition de physique et de T. S. F.*; J. G. Gray, *Gyroscopic stabilizers*; T. C. Fry, *The use of mechanical integration in the practical solution of differential equations by Picard's method of successive approximation*; W. J. Berry, *The influence of mathematics on the development of naval architecture*; L. Woollard, *The teaching of mathematics to students of naval architecture*; A. Planiol, *Sur les pertes par frottements dans les moteurs à explosion*; J. Larmor, *On the cones of steady compression for flying bullets*.

Section V. M. Fréchet, *On a general formula for the computation of net premiums*; R. Henderson, *Some points in the general theory of graduation*; G. U. Yule, *Some life-table approximations*; G. F. McEwen, *A method of estimating the significance of the difference between two*

*averages by means of Bayes' theorem on the probability of proportions;* W. P. Elderton, *Mathematical law of mortality; a suggestion;* L. E. Phragmen, *Sur une méthode d'évaluer les intégrales de probabilité;* A. W. Whitney, *Actuarial science in the field of workmen's compensation insurance; particularly the mathematics of schedule-rating and experience-rating;* W. F. Willcox, *Estimates of population in the United States;* J. W. Glover, *Quadrature formulas when ordinates are not equidistant;* W. F. Sheppard, *Interpolation with least square of error;* H. L. Rietz, *On a certain law of probability of Laplace;* J. F. Steffensen, *On a class of quadrature formulas;* P. R. Rider, *A generalized law of error;* A. L. Bowley, *Use of mathematics in economic, social and public statistics;* A. Fisher, *Application of frequency curves to the construction of mortality tables;* L. March, *De l'erreur probable dans le calcul des moyennes;* C. Gini, *Alcune richerche sulla "fecondabilità" della donna;* H. H. Wolfenden, *On the development of formulae for graduation by linear compounding with special reference to the work of Erastus L. de Forest;* L. J. Reed, *Correlations between climatic factors and death rates;* R. H. Coats and M. C. Maclean, *Jottings from the Canadian census;* R. A. Fisher, *On a distribution yielding the error functions of several well known statistics;* E. C. Molina, *A formula for the solution of some problems in sampling;* G. F. McEwen, *Note on a short method of computing terms and sums of terms of the asymmetrical binomial.*

Section VI. E. Bortolotti, *La memoria "De infinitis hyperbolis" di Torricelli;* F. Cajori, *Past struggles between symbolists and rhetoricians in mathematics;* L. C. Karpinski, *The colonial American arithmetic;* C. J. Keyser, *The doctrinal function: Its role in mathematics and general thought;* A. Korzybski, *Time-binding: The general theory;* F. Cajori, *Uniformity of mathematical notations —a retrospect and prospect;* G. A. Miller, *History of several fundamental mathematical concepts;* J. H. Rogers, *Vilfredo Pareto;* L. G. Du Pasquier, *Unification of arithmetical terminology;* J. Andrade, *Modèles de mouvements pour l'éducation géométrique;* L. Crelier, *Observations pratiques de méthodologie;* J. Vasconcellos, *Sur quelques points de l'histoire des mathématiques des Egyptiens et aussi sur les Siddhautas des Indiens;* H. Fehr, *L'université et la préparation des professeurs de mathématiques.*

ARNOLD DRESDEN