

The articles by Peano, Burali-Forti, Padoa, and Pieri show the point at which the Italian school had arrived in 1900. It is since that time that most of Russell's technical work has appeared. For the present state of the science, we would note a memoir by Whitehead :

(4) "On cardinal numbers," *American Journal of Mathematics*, volume 24 (1902), pages 367-394; and a still more recent paper by Burali-Forti, "Sulla teoria generale delle grandezze e dei numeri," *Atti della R. Accademia delle Scienze di Torino*, volume 39, (January, 1904).

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July, 1904.

NOTES.

THE closing (October) number of volume 26 of the *American Journal of Mathematics* contains the following papers : "Invariants of a system of linear partial differential equations, and the theory of congruences of rays," by E. J. WILCZYNSKI ; "On elements connected each to each by one or the other of two reciprocal relations," by C. DE POLIGNAC.

THE opening (October) number of volume 6 of the *Annals of Mathematics* contains the following papers : "On the subgroups of an abelian group," by G. A. MILLER ; "Note on the continued product of the operators of any group of finite order," by W. B. FITE ; "Reduction of an elliptic integral to Legendre's normal form," by N. R. WILSON ; "The necessary and sufficient condition under which two linear homogeneous differential equations have integrals in common," by A. B. PIERCE ; "A general method of evaluating determinants," by G. MACLOSKIE ; "Application of groups to a complex problem in arrangements," by L. E. DICKSON ; "On functions defined by an infinite series of analytic functions of a complex variable," by M. B. PORTER.

AT the Cambridge meeting of the British association for the advancement of science (cf. October BULLETIN, page 28), Professor A. R. FORSYTH presided over the subsection of pure mathematics, whose programme included the following papers : "A fragment of elementary mathematics," "Geometry of the complex variable," by Professor F. MORLEY ; "Peano's

symbolic method," by Mr. A. N. WHITEHEAD; "The theory of linear partial differential equations," by Major P. A. MACMAHON; "The roots of the characteristic equation of a linear substitution," by Professor T. J. P'A BROMWICH; "The zeros of Taylor's series," by Mr. G. H. HARDY; "Practical trigonometry deduced from a lemma of Archimedes on the trisection of an angle," by Professor P. MANSION; "Binary canon extension," by Lt. Colonel A. CUNNINGHAM; "On the theory of transfinite numbers," by Dr. E. W. HOBSON; "Report on the theory of point groups," "Notes on plane curves," by Mr. H. HILTON; "Note on a special homographic transformation of a screw system," by Professor Sir R. S. BALL; "Note on the theory of continuous groups," by Professor A. R. FORSYTH; "The aims of geometry," by Professor W. F. MEYER; "The theory of vibrations," by Professor V. VOLTERRA; "On the stability of the steady motion of a viscous fluid," by Mr. W. MCF. ORR; "The laws of error," by Professor F. Y. EDGEWORTH; "Note on the Schwarzian derivative," by Professor A. C. DIXON; "Some observations on linear difference equations," by Rev. E. W. BARNES; "On the use of divergent series in astronomy," by Mr. Z. U. AHMAD.

THE annual meeting of the French association for the advancement of science was held at Grenoble, August 4-11, under the presidency of C. A. LAISANT. M. CH. ANDRÉ, director of the observatory at Lyons, presided over the section of mathematics. Besides several papers on astronomy, the following mathematical papers were read: "On resolvent arithmetic spaces," by Professor ARNOUX; "Choice of principles for instruction in geometry," by M. COMBEBIAC; "Reflections concerning non-euclidean hypotheses," by General FROLOV; "Enumeration of finite and infinite continuous groups in space of three dimensions," by Professor LE VASSEUR; "On the number of prime numbers between zero and n ," by Professor LEBON; "Construction of magic squares," by M. TARRY; "Discussion of Professor Méray's methods of instruction in geometry." At the close of this discussion it was voted to invite the minister of public instruction to encourage the introduction of the new method into the secondary schools and the preparation of manuals for the use of the pupils.

The next meeting of the association will be held at Cherbourg, with Professor N. GIARD as president, and Professor G. SAUGRAIN as secretary.

AT the International congress of mathematicians at Heidelberg, there was circulated a printed list of questions, prepared by the editors of *L'Enseignement Mathématique* in collaboration with the Geneva psychologists, Professor TH. FLOURNOY and Dr. E. CLAPARÈDE, on the methods of work practiced by mathematicians. The questions are divided into three groups. The first group deals with the psychological side, embracing such topics as the genesis of a taste for the science, influence of heredity, relative interest in pure and applied mathematics, the roles of chance and inspiration, unconscious cerebration, practice of assimilating existing literature as preparation for an investigation or of leaving the mind at first unfettered, advice to beginners. The second group relates to the mathematician's mode of life, hours of work, regularity of habits, avocations, physical exercise, requisite vacations. The third group invites miscellaneous data of value for the inquiry, effect of narcotics, favorite attitude and appliances while at work, nature of mental images, personal recollections of the habits of deceased mathematicians, etc. Communications respecting the inquiry may be addressed to Professor H. FEHR, 19 rue Gevray, Geneva, Switzerland.

THE second International congress of philosophy met in Geneva, September 4-8, 1904. Of the five sections two were of particular interest to mathematicians, one on the philosophy of the sciences and the other the international congress of the history of the sciences. In the former section the following papers upon mathematics were presented: By Dr. PIERRE BOUTROUX of Paris: "On the notion of correspondence in mathematical analysis"; by Professor JULES ANDRADE of Besançon: "Mechanical geometry"; by Dr. ARNOLD REYMOND of Lausanne: "On geometric judgment."

The section on the history of the sciences, which was occupied almost exclusively with mathematics at the first congress held in Paris in 1900, divided the time this year so as to give considerable attention to the physical sciences. The section was organized by M. PAUL TANNERY, as president of the international commission appointed by the Congress of the history of the sciences, held in Rome in 1903. The papers of special interest to mathematicians were as follows: By Professor H. G. ZEUTHEN of Copenhagen: "The origins of scientific geometry (the Pythagorean theorem)"; by Professor VICTOR

MORTET of Paris : "On geometry among the Latins" ; by M. HENRY BERR of Paris : "Gassendi as an historian of the sciences" ; by Baron CARRA DE VAUX : "On the mechanics of the Arabs" ; by Professor P. DUHEM of Bordeaux : "History of dynamics (on the acceleration produced by a constant force)."

In Professor Zeuthen's paper, read by M. Tannery, the attempt is made to discover not the method by which Pythagoras demonstrated his theorem (a probably futile inquiry), but the succession of ideas leading to the earlier discovery of the proposition by the Hindus and the Egyptians. His analysis of the processes in the *Çulvasutras* has led to certain unexpected points of contact and to new conjectures which merit serious attention.

Professor Duhem, by an argument based upon undisputed texts, established a thesis already suggested by M. Paul Tannery, that the discovery of Galileo's law was inspired by ideas essentially different from those of to-day. The preamble of every history of dynamics must henceforth be this : The notion of force in dynamics is a concept created by Newton and defined by him through the enunciation of principles now classic. Before Newton's time the word was used in a vague and very different sense ; the only clear mechanical notions were those of movement and speed.

The congress was hospitably entertained by the citizens of Geneva. On September 4 a reception was given at the residence of Dr. E. Claparède, the general secretary. On Monday evening, September 5, a steamboat excursion was taken to Coppet, followed by a dinner and by the illumination of the lake front. On Tuesday evening there was an excursion to Mont Salève, and on Wednesday evening one to Chougny, where a reception was held by M. Agénor Boissier. On Thursday evening the congress closed with a banquet given by the city of Geneva, in the foyer of the theater.

AN official history of the *Deutsche Mathematiker-Vereinigung*, prepared by the secretary, Professor A. GUTZMER, of Jena, was issued on the occasion of the recent Heidelberg Congress. Besides the history of the society's development, the pamphlet contains a report of each of its annual meetings, the list of members, and the table of contents of each volume of the *Jahresbericht*.

ON the occasion of the Heidelberg Congress, the firm of B. G. Teubner in Leipzig issued the hundredth edition of its catalogue of mathematical and technical books. Among the books in advanced preparation may be mentioned the following: Clebsch-Lindemann, *Vorlesungen über Geometrie*, Teil 1, second edition; Enriques, *Fragen der Elementargeometrie*, translated into German by H. Fleischer; Fricke, *Kurzgefasste Vorlesungen über verschiedene Gebiete der höheren Mathematik*, Teil 2: *Algebra und Geometrie*; Minkowski, *Geometrie der Zahlen*, zweite Lieferung; Weber und Wellstein, *Encyclopädie der Elementar-Mathematik*, volumes 2 and 3.

ARRANGEMENTS have been completed for extending Cantor's *Geschichte der Mathematik* by the addition of one or possibly two more volumes, covering the period from 1758 to 1799. The task will be undertaken by the following collaborators, and is to be completed in 1906: 1. History, classical editions, lexicons, S. GÜNTHER of Munich; 2. Textbooks on elementary geometry, theory of parallels, V. BOBYNIN of Moscow; 3. Trigonometry and tables, A. VON BRAUNMÜHL of Munich; 4. Algebra and theory of numbers, F. CAJORI of Colorado; 5. Series, combinations, probabilities and imaginaries, E. NETTO of Giessen; 6. Analytic geometry of the plane and of space, V. KOMMERELL of Reutlingen; Descriptive geometry, G. LORIA of Genoa; 7. Textbooks on the calculus, definite integrals and transcendents, G. VIVANTI of Messina; 8. Total and partial differential equations, calculus of variations and finite differences, C. R. WALLNER of Munich; 9. Development of mathematics from 1759 to 1799, M. CANTOR of Heidelberg.

THE Open Court publishing company of Chicago has begun the publication of a series of portraits of mathematicians, from the collection of Professor D. E. SMITH. The first installment of twelve, chosen to represent important mathematical advances prior to 1700, is now in the press.

THE various foreign universities will offer courses in mathematics during the winter semester of 1904–1905 as follows:

UNIVERSITY OF BERLIN. — By Professor H. A. SCHWARZ: Differential calculus, four hours; with exercises, two hours; Theory of elliptic functions, four hours; Selected chapters on analytic functions, two hours; Colloquium, two hours; Semi-

nar, two hours. — By Professor G. FROBENIUS : Algebra, four hours ; Seminar, two hours. — By Professor F. SCHOTTKY : Theory of functions, four hours ; Analytic mechanics, four hours ; Seminar, two hours. — By Professor J. KNOBLAUCH : Definite integrals, four hours ; Theory of surfaces, four hours ; Twisted curves, one hour. — By Professor G. HETTNER : Introduction to the theory of determinants, two hours. — By Professor R. LEHMANN-FILHÉS : Analytic geometry, four hours. — By Dr. E. LANDAU : Integral calculus, four hours ; with exercises, one hour ; Theory of quadric surfaces, two hours ; Theory of aggregates, one hour. — By Dr. J. SCHUR : Algebraic theory of quadratic forms, two hours ; Theory of numbers, four hours.

UNIVERSITY OF BONN. — By Professor H. KORTUM : Algebra, four hours ; Quadratic forms, two hours ; Seminar, one hour. — By Professor E. STUDY : Mechanics I, three hours ; Analytic geometry II, four hours ; with exercises, one hour ; Seminar, one hour. — By Professor L. HEFFTER : Differential and integral calculus II, four hours ; Descriptive geometry with exercises, five hours ; Seminar, one hour.

UNIVERSITY OF KÖNIGSBERG. — By Professor F. W. MEYER : Applied mathematics, four hours ; with exercises, one hour ; Determinants, two hours. — By Professor A. SCHOENFLIES : Introduction to the theory of differential equations, four hours ; Quadric surfaces, two hours ; Seminar, one hour. — By Professor L. SAALSCHÜTZ : Bernoulli's numbers, two hours ; Integral calculus, four hours ; with exercises, two hours. — By Dr. T. VAHLEN : Non-euclidean geometry, three hours.

UNIVERSITY OF STRASSBURG. — By Professor T. REYE : Geometry of position, three hours ; Analytic mechanics, two hours ; Seminar, one hour. — By Professor H. WEBER : Differential and integral calculus, four hours ; Algebra, three hours ; Seminar, one and one half hours. — By Professor M. SIMON ; History of mathematics, two hours. — By Professor M. DISTELI : Plane analytic geometry, three hours ; Descriptive geometry with exercises, four hours ; Theory of screws, one hour ; Seminar, one hour. — By Professor J. WELLSTEIN : Differential and integral calculus, four hours. — By Dr. P. EPSTEIN : Introduction to the theory of numbers, three hours.

UNIVERSITY OF CZERNOWITZ. — By Professor K. DAUBLEBSKY VON STERNECK: Differential and integral calculus, five hours; Seminar, two hours.

UNIVERSITY OF GRAZ. — By Professor J. FRISCHAUF: Algebraic analysis, three hours; Analytic geometry, two hours. — By Professor K. V. VON DANTSCHER: Analysis, five hours; Seminar, two hours. — By Professor H. STREINTZ: Descriptive geometry, three hours; Statistics I, three hours. — By Dr. K. CARDA: Partial differential equations of the first order, two hours. — By Dr. J. PLEMELJ: Linear differential equations, two hours. — By Dr. J. GRÜNWARD: Line geometry, two hours.

UNIVERSITY OF GENOA. — By Professor G. LORIA: Theory of algebraic forms with applications to geometry, four hours. — By Professor F. PORRO: Theoretical astronomy, four hours. — By Professor O. TEDOME: Calculus of variations and differential equations, four hours. — By Dr. E. ALMANSI: The Helmholtz theory of vortices, four hours.

GERMAN UNIVERSITY OF PRAGUE. — By Professor G. PICK: Differential and integral calculus, five hours; Seminar, two hours. — By Professor J. GMEINER: Algebraic equations, three hours; Theory of functions of a complex variable, two hours.

UNIVERSITY OF VIENNA. — By Professor G. VON ESCHERICH: Theory of functions, five hours; Seminar, two hours. — By Professor MERTENS: Algebra, five hours; Seminar, two hours. — By Professor W. WIRTINGER: Differential and integral calculus, five hours; with exercises, two hours; Seminar, two hours. — By Professor G. KOHN: Synthetic geometry, four hours; with exercises, two hours; Differential geometry, two hours. — By Dr. A. TAUBER: Mathematics of insurance, four hours. — By Dr. E. BLASCHKE: Mathematical theory of statistics, two hours.

PROFESSOR M. BRENDDEL, of Göttingen, has been elected a member of the Leopold-Carolus academy of natural sciences.

PROFESSOR R. FRICKE has been elected rector of the technical school at Brunswick, and a corresponding member of the Göttingen royal society.

PROFESSOR H. GRASSMANN, of Halle, has been appointed associate professor of mathematics at the University of Giessen; he was also recently elected a member of the Leopold-Carolus academy of natural sciences.

DR. F. GUARDUCCI, of Florence, has been appointed professor of geodesy at the University of Bologna.

PROFESSOR L. HEFFTER, of Bonn, has been appointed professor of mathematics at the technical school at Aachen.

PROFESSOR A. PRINGSHEIM, of Munich, has been elected corresponding member of the Göttingen royal society.

PROFESSOR K. ROHN, of Dresden, has been appointed professor of mathematics at the University of Leipzig, and is to transfer from Dresden at Easter, 1905.

DR. K. SCHREBER has been appointed professor of mechanics at the University of Greifswald.

PROFESSOR J. SOMMER, of Poppelsdorf, has been appointed professor of mathematics at the new technical school at Danzig.

PROFESSOR L. SYLOW, of Christiana, has been named knight of the order "pour le mérite" for arts and sciences.

M. J. TANNERY has been appointed professor of the calculus in the faculty of sciences at the University of Paris.

PROFESSOR A. WANGERIN, of Halle, has been elected a corresponding member of the Academy of sciences at Erfurt.

DR. G. HERGLOTZ has been appointed docent in mathematics and astronomy at the University of Göttingen.

PROFESSORS O. E. MEYER, of Breslau and F. ROTH, of Strassburg, have retired from giving academic courses.

PROFESSOR F. LINDEMANN has been elected rector of the University of Munich for the year 1904–1905. Professor F. DINGELDEY has been elected rector of the technical school at Darmstadt. Professor F. SCHUR has been elected rector of the technical school at Karlsruhe.

DR. G. PRASAD has been appointed professor of mathematics at the Muir Central College in Allahabad, India.

AT the University of California, Dr. D. N. LEHMER and Mr. A. W. WHITNEY have been promoted to assistant professorships of mathematics. Dr. B. L. NEWKIRK has been appointed instructor, and Mr. A. J. CHAMPREUX assistant in mathematics. Dr. E. M. BLAKE has been appointed professor of mathematics at the University of Arizona, succeeding Professor S. M. WOODWARD, who has accepted a position in the engineering department of the University of Iowa.

PROFESSOR H. V. GUMMERE, of Ursinus College, has been appointed professor of mathematics in the Drexel Institute, Philadelphia.

THE following academic appointments are also announced: Dr. E. L. DODD, instructor in mathematics, University of Iowa; Mr. A. HALL, instructor in mathematics, U. S. Naval Academy; Mr. J. H. BARTON, instructor in mathematics, Dartmouth College; Dr. H. C. CONVERSE, instructor in mathematics, Baltimore Polytechnic Institute; Mr. W. W. DAVIS, tutor in mathematics, Northwestern University; Messrs. T. E. GRAVATT and C. F. SHOOP, instructors in mathematics, Pennsylvania State College.

AT Rutgers College, Professor E. A. BOWSER has been made emeritus professor of mathematics.

MR. R. W. H. T. HUDSON, lecturer in mathematics in the University of Liverpool, met with a fatal accident in the mountains of north Wales on September 2. Mr. Hudson, who was the son of Professor W. H. H. Hudson, of King's College, London, was but twenty-eight years of age.