In the first of these papers he determines all directions of a space R_μ of μ dimensions through a point P of R_μ, which are normal to all the directions of a second space R_λ containing the point P, when R_μ and R_λ are both immersed in a general space R_n whose arc element is given by

$$ds^2 = \Sigma a_{ik} dx_i dx_k.$$

In the second paper he develops the symbolic expression for Kronecker's extension of Gauss's curvature of a surface to a space of n dimensions R_n, immersed in a euclidean space of $n + 1$ dimensions, in terms of the symbols of the differential quantic

$$ds^2 = \Sigma a_{ik} du_i du_k \qquad (i,\ k = 1,\ 2,\ \cdots,\ n),$$

which defines the arc element of R_n, and then generalizes his results to a space R_λ of λ dimensions immersed in a general space of n dimensions, and defined by $n - \lambda$ relations

$$U' = \text{const}, \quad U'' = \text{const}, \quad \cdots, \quad U^{(n-\lambda)} = \text{const}.$$

Further applications are sure to follow, and Maschke's symbolic method will doubtless play in the theory of differential quantics a rôle similar to that of the ordinary symbolic method of Aronhold and Clebsch in the theory of algebraic quantics, thus, together with his contributions to the theory of linear substitution groups, securing him a permanent place in the history of mathematics.

<div style="text-align: right">OSKAR BOLZA.</div>

FREIBURG, I. B.,
August 8, 1908.

NOTES.

AT the annual meeting of the AMERICAN MATHEMATICAL SOCIETY, to be held in the last week of December, President H. S. WHITE will deliver his retiring address, the subject of which will be " Bezout's theory of resultants and its influence on geometry."

THE second regular meeting of the Southwestern Section of the AMERICAN MATHEMATICAL SOCIETY will be held at the University of Kansas, Lawrence, Kansas, on Saturday, November 28. Titles and abstracts of papers to be presented at this meeting should be in the hands of the Secretary of the Section, Professor O. D. Kellogg, University of Missouri, Columbia, Mo., on or before November 14.

The concluding (October) number of volume 9 of the *Transactions* of the AMERICAN MATHEMATICAL SOCIETY contains the following papers : " Boundary values and expansion problems of ordinary linear differential equations," by G. D. BIRKHOFF ; " An application of the form problems associated with certain Cremona groups to the solution of equations of higher degree," by A. B. COBLE ; " On the differential equations of the equilibrium of an inextensible string," by E. B. WILSON ; " The properties of curves in space which minimize a definite integral," by MAX MASON and G. A. BLISS ; " The second derivatives of the extremal integral," by ARNOLD DRESDEN ; " Sets of metrical hypotheses for geometry," by R. L. MOORE ; " Notes and errata, volume 9."

The concluding (October) number of volume 30 of the *American Journal of Mathematics* contains the following papers : " On a group of transformations which occurs in the problem of several bodies," by E. O. LOVETT ; " Normal curves of genus 6, and their groups of birational transformations," by VIRGIL SNYDER ; " On the range of birational transformations of curves of genus greater than the canonical form," by VIRGIL SNYDER ; " A set of assumptions for projective geometry," by OSWALD VEBLEN and J. W. YOUNG ; " On the pentastroid," by R. P. STEPHENS ; " A table of the values of m corresponding to given values of $\phi(m)$," by R. D. CARMICHAEL.

THE seventy-eighth meeting of the British association for the advancement of science was held at Dublin, September 2–9, 1908, under the presidency of Professor F. DARWIN, Dr. W. N. SHAW being chairman of section A, mathematics and physics. Twenty-four papers, mainly on physical or astronomical subjects, were read, many of which took the nature of symposia. The next meeting will be held at Winnipeg, Canada, opening August 25, 1909, under the presidency of Professor J. J. THOMSON.

THE thirty-seventh annual meeting of the French association for the advancement of science was held at Clermont-Ferrand, August 3 to 10, 1908, under the presidency of Professor P. APPELL, dean of the faculty of sciences of the University of Paris. The following papers were read before Sections one and two, mathematics, astronomy, geodesy and mechanics. By E. N. BARISIEN, " Solution of the equation of the third

degree "; by E. Borel, "Instruction in mathematics given by the universities"; by A. Boutin, "On a certain group of numbers"; by A. Boutin, "Development of $\sqrt{N}$ in a continued fraction, and the solution of Fermat's equations"; by E. Lebon, "Investigation of prime factors of large numbers"; by A. Pellet, "On equations having only real roots"; by P. Appell, "On a theorem relative to the initial displacement of a system without friction"; by A. Gérardin, "Study of numbers in affinity"; by A. Gérardin, "On the solution of the equation $x^p \pm ay^2 = A^2$ in terms of positive integers"; by A. Gérardin, "General solutions of the equation $ax^2 + by^2 = cz^2 + dt^2$"; by J. Richard, "Some points in the philosophy of mathematics"; by J. Richard, "Instruction in astronomy"; by T. Rousseau, "Elementary geometry based on the group of displacements"; by J. Welsch, "On homographic correspondence and its application to the solution of a large number of problems"; by H. Chrétien, "The comet Daniel 1907-d and its spectrum"; by H. Chrétien, "A new model for spectroheliography"; by L. Libert, "A catalogue of twenty-five meteors"; by E. Belot, "Essay on cyclonic cosmogeny."

The next meeting of the association will be held at Lille in 1909, sections one and two under the chairmanship of Professor E. Lebon.

The annual list of American doctorates published in *Science* presents for the academic year 1907–1908 360 names, of which 184 are credited to the sciences. The following 22 successful candidates offered mathematics as major subject (the titles of the theses are appended): E. G. Bill, Yale, "An a priori existence theorem for three dimensions in the calculus of variations"; R. L. Börger, Chicago, "On the determination of ternary linear groups in the Galois field of order p^2"; G. G. Chambers, Pennsylvania, "The groups of isomorphisms of the abstract groups of order p^2q"; G. M. Conwell, Princeton, "The 3-space projective geometry (3, 2) and its group"; Miss E. B. Cowley, Columbia, "Plane curves of the eighth order having two four-fold points with distinct tangents and no other point singularities"; C. F. Craig, Cornell, "On a class of hyperfuchsian functions"; F. J. Holder, Yale, "Multiple series;" L. Ingold, Chicago, "Vector interpretation of symbolic parameters"; F. Irwin, Harvard, "The invariants of linear differential expressions"; N. J. Lennes, Chicago,

" Curves in non-metrical analysis situs, with applications to the calculus of variations and differential equations " ; J. J. Luck, Virginia, " The structures of the non-integrable groups of seven parameters " ; E. B. Lytle, Yale, " Multiple series over iterable fields " ; C. N. Moore, Harvard, " On the theory of convergence factors and some of its applications " ; F. W. Owens, Chicago, " The introduction of ideal elements and construction of projective n-space in terms of a plane system of points involving order and Desargues's theorem " ; E. C. F. Phillips, Johns Hopkins, " On the pentacardioid ; " J. H. Scarborough, Vanderbilt, " The computation of the orbit of a planet " ; Miss M. E. Sinclair, Chicago, " On a compound discontinuous solution connected with the surface of revolution of minimum area " ; H. L. Slobin, Clark, " On plane quintic curves " ; Miss A. L. Van Benschoten, Cornell, " The birational transformations of algebraic curves of genus 4 " ; N. R. Wilson, Chicago, " Isoperimetric problems which are reducible to non-isoperimetric problems " ; H. C. Wolff, Wisconsin, " The continuous plane motion of a liquid bounded by two right lines " ; Miss E. R. Worthington, Yale, " Some theorems on surfaces."

The number of American doctorates in mathematics for each year of the last decade is 13, 11, 18, 8, 7, 14, 21, 11, 13, 22.

The Italian scientific society has awarded its gold medal for his researches in mathematics to the late professor G. Picciati, of the University of Bologna.

Professor C. Somigliana, of the University of Turin, has been elected member of the Accademia dei Lincei.

Professor E. Almansi, of the University of Pavia, has been elected corresponding member of the institute of Lombardy.

Professor F. Severi, of the University of Padua, has been elected corresponding member of the Institute of Venice.

Professor V. Volterra, of the University of Rome, has been elected foreign associate of the academy of sciences of Halle.

Dr. R. Bonola has been appointed docent in projective and and descriptive geometry at the University of Pavia.

Dr. M. N. Vanecek, of the Bohemian technical school at Prague, has been promoted to an associate professorship of mathematics.

PROFESSOR W. FENSSNER, of the University of Marburg, has been made honorary professor.

PROFESSOR R. FRICKE, of the technical school at Brunswick, has declined a call to the professorship of mathematics at the technical school at Hanover.

PROFESSOR H. A. LORENTZ, of the University of Leiden, has been elected foreign knight of the order pour le mérite in sciences and arts.

PROFESSOR H. POINCARÉ has been elected honorary member of the physico-chemical society of Erlangen.

MR. R. F. SCOTT has been elected master of St. John's College, Cambridge, in succession to the late Dr. C. TAYLOR.

PROFESSOR M. LACOMBE, of the technical school at Zürich, has been appointed professor of geometry at the University of Lausanne, as successor to the late Professor Joly.

DR. H. HUSSON has been appointed professor of mechanics at the University of Caen.

PROFESSOR M. DULAC, of the University of Poitiers, has been appointed professor of mathematics at the scientific school of Algiers.

DR. M. BOURGEOIS has been appointed professor of astronomy and geodesy at the Ecole polytechnique of Paris, to succeed Professor H. POINCARÉ, who has retired.

PROFESSOR A. S. CHESSIN, of Washington University, St. Louis, has been granted a year's leave of absence.

MR. F. H. HODGE has been appointed professor of mathematics at Parsons College, Fairfield, Iowa.

AT the University of North Carolina, Professor A. HENDERSON has been promoted to a full professorship of mathematics. Mr. G. K. G. HENRY and Mr. J. C. HINES have been appointed instructors in mathematics.

AT the University of Kansas Mr. G. W. HARTWELL, of Columbia University, has been appointed assistant professor of mathematics; Dr. P. WERNICKE, of Washington University, Mr. M. GABA and Mr. C. A. PIERCE have been appointed instructors in mathematics.

AT the Worcester Polytechnic Institute Professor L. L. CONANT has been promoted to the head professorship of mathematics; Professor A. D. BUTTERFIELD, of the University of Vermont, has been appointed assistant professor of mathematics; Mr. J. J. BULLARD and Mr. J. H. REDFIELD have been appointed instructors in mathematics.

PROFESSOR G. A. BLISS, of Princeton University, has been appointed associate professor of mathematics at the University of Chicago.

PROFESSOR T. E. McKINNEY, of Wesleyan University, has been appointed professor of mathematics at the University of South Dakota.

MR. N. C. RIGGS has been appointed assistant professor of mathematics at the Carnegie Technical School at Pittsburg.

DR. W. B. STONE and Mr. J. B. CLEVELAND have been appointed instructors in mathematics at the University of Michigan.

MR. H. F. MacNEISH has been appointed instructor in mathematics at Princeton University.

DR. R. L. MOORE, of Princeton University, has been appointed instructor in mathematics at Northwestern University.

DR. E. B. LYTLE has been appointed instructor in mathematics at the University of Illinois.

MR. C. W. COBB has been appointed instructor in mathematics at Amherst College.

RECENT catalogues of second hand mathematical books: Conrad Skopnik, Berlin N. W. 7, Prinz Louis Ferdinandstrasse 1, catalogue no. 39, 95 titles on mathematics. — Theodor Ackermann, Munich, 10 Promenadeplatz, catalogue no. 572, 903 titles, partly mathematical. — J. Schweitzer, Munich, Lenbachplatz 1, catalogue no. 45, 76 titles. — Eduard Beyer's Nachfolger, Vienna, Schottengasse 7, catalogue no. 48, exact sciences, 2250 titles.