following two reasons: "Firstly, because such problems aid in giving the student a clearer idea of the way in which the trigonometric functions vary as the angle is changed, and secondly, because of a very common lack of sufficient knowledge of polar coordinates on the part of students beginning the study of calculus." This work is introduced early in the book—earlier, indeed, than seems advisable, as it precedes the treatment of the relation of the functions of angles differing by 90° and 180°, a working knowledge of which would render the process of graphing far less difficult.

In the explanation of logarithms and the use of tables of logarithms and trigonometric functions, the authors have avoided the rather common error of being so brief as to be fully intelligible only to one already understanding the subject. Their treatment is clear and explicit, supplemented by problems for the student to solve.

CORA B. HENNEL.

NOTES.

THE twentieth annual meeting of the American Mathematical Society will be held in New York City on Tuesday and Wednesday, December 30–31, 1913. At this meeting Professor H. B. FINE will deliver his Presidential Address, on "An unpublished theorem of Kronecker respecting numerical equations." Titles and abstracts of papers intended for presentation at the annual meeting should be in the hands of the Secretary by December 13.

THE opening (September) number of volume 15 of the *Annals of Mathematics* contains the following papers: "Singular point transformations in two complex variables," by G. R. CLEMENTS; "On the projective differential geometry of plane anharmonic curves," by S. W. REAVES; "On the rank of a symmetrical matrix," by L. E. DICKSON; "Note on the rank of a symmetrical matrix," by J. H. M. WEDDERBURN; "On the numerical factors of the arithmetic forms $\alpha^n \pm \beta^n$," by R. D. CARMICHAEL.

THE concluding (October) number of volume 35 of the *American Journal of Mathematics* contains the following

papers: "On the four-dimensional angles of the semiregular polytopes of S_4," by P. H. SCHOUTE; "A generalization of Volterra's derivative of a function of a curve," by C. A. FISCHER; "On differential invariants," by J. B. SHAW; "Some properties of closed convex curves in a plane," by A. EMCH; "Finiteness of the odd perfect and primitive abundant numbers with n distinct prime factors," by L. E. DICKSON; "Even abundant numbers," by L. E. DICKSON; "The identical relations between the elements of any oblique triple system of surfaces," by H. D. THOMPSON; "Transformations and invariants connected with linear homogeneous difference equations and other functional equations," by CORA B. HENNEL; "Projective differential geometry of rational cubic curves," by J. A. NYBERG.

To the list of American doctorates conferred in 1913 which appeared in the October BULLETIN, should be added, T. H. BROWN, Yale, "The effect of radiation on a small particle revolving about Jupiter"; and H. N. WRIGHT, California, "On a tabulation of reduced binary quadratic forms of a negative determinant."

THE following courses in mathematics are announced in the several technical schools during the first semester 1913–1914:

BERLIN.—By Professor E. LAMPE: Differential and integral calculus, with exercises, eight hours; Definite integrals and differential equations, two hours.—By Professor G. HETTNER: Differential and integral calculus, with exercises, eight hours; Differential equations, two hours.—By Professor G. SCHEFFERS: Descriptive geometry, ten hours.—By Professor O. KRIGAR-MENZEL: Mechanics, four hours; Acoustics, two hours; Theory of equilibrium, four hours.—By Professor G. WALLENBERG: Selected chapters of elementary mathematics, four hours; Theory of functions, two hours; Theory of potential, two hours.—By Professor ST. JOLLES: Descriptive geometry, ten hours; Graphical statics, with exercises, four hours.—By Professor K. HAENTZSCHEL: Elements of the calculus, with exercises, six hours; Mechanics, four hours.

BRUNSWICK.—By Professor R. DEDEKIND: Elements of the theory of numbers, two hours; Introduction to the calculus

of probability, one hour.—By Professor R. FRICKE: Analytic geometry and algebra, four hours; Differential and integral calculus, with exercises, six hours.—By Professor H. E. TIMERDING: Algebra, two hours; Geometry of position, two hours; Descriptive geometry with exercises, ten hours.—By Professor A. WERNICKE: Statics of rigid bodies, with exercises, six hours.—By Professor W. SCHLINK: Technical mechanics, II, with exercises, five hours.

CLAUSTHAL.—By Professor H. MOHRMANN: Higher mathematics and mechanics, six hours; Descriptive geometry, four hours.

DELFT.—By Professor J. A. BARRAU: Determinants and introduction to the calculus, three hours; Theory of projection, with exercises, four hours; Applications of descriptive geometry, three hours.—By Professor W. H. L. JANSSEN VAN RAAY.—Advanced algebra and the calculus, five hours; Advanced calculus, four hours.—By Professor W. A. VERSLUYS: Introduction to analytic geometry, two hours; Analytic geometry of space, two hours.—By Professor J. CARDINAAL: Methods of projection, four hours; Surfaces and space curves, four hours.—By Professor G. SCHOUTEN: Mechanics, four hours; Kinematics, four hours.

DRESDEN.—By Professor G. HEGER: Plane cubic curves, one hour.—By Professor G. HELM: Higher mathematics, IV, with exercises, four hours; Theory of potential, three hours; Colloquium, two hours.—By Professor M. KRAUSE: Higher mathematics, II, with exercises, six hours; Advanced algebra, four hours; Seminar, two hours.—By Professor W. LUDWIG: Descriptive geometry, with exercises, seven hours; Perspective, one hour; Analytic geometry of quadric surfaces, three hours; History of mathematics in antiquity, one hour.

KARLSRUHE.—By Professor A. KRAZER: Mathematics, I, with exercises, eight hours.—By Professor R. FUETER: Higher mathematics, II, three hours; Partial differential equations with applications, two hours.—By Professor M. DISTELI: Descriptive geometry, with exercises, eight hours; Graphical statics, with exercises, two hours.—By Dr. W. VOGT: Analytic geometry of the plane and of space, three hours; Projective geometry, two hours.—By Dr. F. NOETHER: Elements of mechanics, with exercises, four hours; Theory of elasticity,

two hours.—By Dr. O. HAUPT: Arithmetic and algebra, with exercises, three hours; Plane and spherical trigonometry, with exercises, three hours; Exercises in the principles of higher mathematics, two hours.

STUTTGART.—By Professor HALLER: Plane and spherical trigonometry, with exercises, four hours.—By Professor E. STÜBLER: Lower analysis, four hours; Differential and integral calculus, four hours.—By Professor W. KUTTA: Higher mathematics, II, with exercises, eight hours; Seminar, two hours.—By Professor E. WÖLFFING: Theory of functions, I, three hours.—By Professor R. MEHMKE: Descriptive geometry, with exercises, seven hours; Graphical calculation, with exercises, three hours; Seminar, two hours.—By Professor K. KOMMERELL: Foundations of geometry, two hours.

ZURICH.—By Professor A. HIRSCH: Higher mathematics, I, five hours; Higher mathematics, III, four hours.—By Professor FRANEL: Higher mathematics, I, five hours; Higher mathematics, III, four hours.—By Professor H. WEYL: Analytic geometry, with exercises, six hours.—By Professor M. GROSSMANN: Descriptive geometry, with exercises, eight hours; Projective geometry, four hours; Seminar, two hours.—By Professor L. KOLLROS: Descriptive geometry, with exercises, eight hours; Projective geometry, four hours; Seminar, two hours.—By Professor A. HURWITZ: Algebraic equations, four hours; Seminar (with Professor Weyl), two hours.—By Dr. L. KIENAST: Theory of functions of a complex variable, two hours.—By Dr. A. KRAFT: Theory of extension and vector analysis, four hours.

MASS. INSTITUTE OF TECHNOLOGY.—By Professor F. S. WOODS: Advanced calculus and differential equations, four hours.—By Professor F. H. BAILEY: Fourier's series, two hours.—By Professor E. B. WILSON: Analytic mechanics, two hours; Relativity, two hours.

DR. W. BLASCHKE, of the University of Greifswald, has been appointed associated professor of mathematics in the German technical school at Prague.

DR. F. RUSCH, of the University of Zurich, has been appointed professor of mathematics and physics at the University of Tientsin.

DR. H. TIETZE, of the German technical school at Brünn, has been promoted to a full professorship of mathematics.

PROFESSOR G. FABER, of the University of Königsberg, has been appointed professor of mathematics in the University of Strassburg.

DR. L. BIEBERBACH, of the University of Königsberg, has been appointed professor of mathematics in the University of Basel.

PROFESSOR GINO LORIA, of the University of Genoa, has been elected to membership in the Halle academy of sciences.

AT the annual meeting of the royal academy dei Lincei, of Rome, Professor G. BAGNERA, of the University of Palermo, was elected to corresponding membership; Professor I. FREDHOLM, of the University of Stockholm, Dr. G. W. HILL, of Nyack, N. Y., and Professor A. HURWITZ, of the technical school at Zürich, were elected foreign members.

PROFESSOR F. KLEIN, of the University of Göttingen, has been elected foreign member of the academy of sciences of Naples and corresponding member of the Berlin academy of sciences.

DR. H. CHATELET has been appointed professor of mechanics at Toulouse, to succeed Professor J. DRACH, who has accepted a similar position at the University of Paris.

DR. R. GARNIER has been appointed professor of mathematics at the University of Poitiers, as successor to Professor P. BOUTROUX, now of Princeton University.

PROFESSOR A. L. BOWLEY, of University College, Reading, has resigned.

PROFESSOR W. H. YOUNG, of Liverpool University, has been appointed Hardinge professor of mathematics at the University of Calcutta, for the purpose of organizing the school of higher mathematics. As his new duties require his residence in India only part of the time, he will retain his present professorship in Liverpool University.

AT Princeton University Professor H. B. FINE has returned from a year's leave of absence and resumed his duties as head of the department of mathematics and dean of the departments of science. Professor OSWALD VEBLEN is abroad on leave of absence for the year.

AT Ohio Wesleyan University, Professor G. N. Armstrong, who has been abroad on leave of absence, has resumed his academic duties.

PROFESSOR L. A. HOWLAND, of Wesleyan University, has been promoted to a full professorship of mathematics.

AT Rutgers College, Professor RICHARD MORRIS has been promoted to the professorship of mathematics, and appointed head of the department. Dr. W. B. STONE, of the University of Michigan, has been appointed assistant professor of mathematics.

PROFESSOR F. CAJORI, of Colorado College, has received the honorary degree of doctor of laws from the University of Colorado and the honorary degree of doctor of science from the University of Wisconsin.

PROFESSOR S. E. RASOR, of Ohio State University, has been promoted to a full professorship of mathematics.

DR. W. C. KRATHWOHL has been appointed associate professor of mathematics in Ripon College.

AT Lehigh University Dr. J. B. REYNOLDS has been promoted to an assistant professorship of mathematics; Mr. M. S. KNEBELMAN has been appointed instructor in mathematics.

PROFESSOR L. C. PLANT, of the University of Montana, has accepted the professorship of mathematics at the Michigan Agricultural College. Dr. N. J. LENNES, of Columbia University, succeeds Professor Plant at the University of Montana.

DR. S. LEFSCHETZ, of the University of Nebraska, has been appointed instructor in mathematics in the University of Kansas.

MR. G. W. MULLINS and Mr. J. A. NORTHCOTT have been appointed instructors in mathematics in Columbia University.

MR. F. W. DARLING has been appointed instructor in mathematics at Cornell University.

MR. H. R. KINGSTON has been appointed instructor in mathematics at the University of Manitoba.

MISS M. MCDONALD has accepted the professorship of mathematics at Oxford College for Women, Oxford, Ohio.

DR. JOSEPHINE E. BURNS has been appointed instructor in mathematics at the University of Illinois.

PROFESSOR C. BOURLET, of the Conservatoire des Arts et Métiers in Paris, died August 7, at the age of 47 years.

M. GASTON TARRY died at Havre, June 21, 1913, at the age of 70 years.

THE death is announced of Dr. G. ROTH, emeritus professor of mathematics in the University of Strassburg.

PROFESSOR ALEXANDER MACFARLANE, formerly of the University of Edinburgh, the University of Texas, and Lehigh University, died August 28, at the age of 62 years. He had been a member of the American Mathematical Society since 1891.

PROFESSOR J. R. EASTMAN, professor of mathematics in the U. S. Navy from 1865 to 1898, died September 26, at the age of seventy-seven years.