

brought to the understanding of even a dull student that all elementary texts on mechanics presupposing the calculus should not omit this important finishing touch.

A small list of misprints which have come to the attention of the reviewer is herewith given.

- P. 27, line 12 from below: omit index in v .
 P. 37, line 5 from above: read acceleration times Δt .
 P. 40, line 7 from below: read $r\dot{\theta}$ instead of $r\theta$.
 P. 44, line 3 from below: read $v_0 \sin(\epsilon t)$.
 P. 56, line 3 from above: read $a(\cos \epsilon \cos \mu t + \sin \epsilon \sin \mu t)$.
 P. 61, line 2 from above: read $= OP_x$.
 P. 200, line 4 from above: read the potential is constant.
 P. 256, line 6 from above: read $\sqrt{k/z}$.
 P. 324, line 11 from below: factor dt left out on right side.
 P. 361, Article 7, problem 7: 47 miles.
 P. 373, Article 56, problem 7: first inside bracket is to be squared.
 P. 373, Article 334, problem 7: $44^\circ 34'$.

KURT LAVES.

NOTES.

THE July number (volume 14, number 3) of the *Transactions of the American Mathematical Society* contains the following papers: "Proof of the finiteness of modular covariants," by L. E. DICKSON; "On transcendently transcendental functions," by R. D. CARMICHAEL; "Sur les classes V normales," by M. FRÉCHET; "Implicit functions defined by equations with vanishing Jacobian," by G. R. CLEMENTS; "On the approximate representation of an indefinite integral and the degree of convergence of related Fourier's series," by D. JACKSON; "Certain continuous deformations of surfaces applicable to the quadrics," by L. P. EISENHART.

THE July number (volume 35, number 3) of the *American Journal of Mathematics* contains the following papers: "The primitive groups of class twelve," by W. A. MANNING; "The cartesian oval and the elliptic functions p and σ ," by CLARA L. BACON; "The indices of permutations and the derivation therefrom of functions of a single variable associated with the permutations of any assemblage of objects," by P. A. MACMAHON; "Conjugate line congruences of the third order defined by a family of quadrics," by HELEN B. OWENS.

UNDER the auspices of the Edinburgh mathematical society a mathematical colloquium was held at Edinburgh during the week August 4-9. Courses of five lectures each were given by Professor A. W. CONWAY on "The theory of relativity and the new physical ideas of space and time"; by Professor D. M. Y. SOMERVILLE on "Non-euclidean geometry and the foundations of geometry"; and by Professor E. T. WHITTAKER on "Practical harmonic analysis and periodogram analysis; an illustration of mathematical laboratory practice."

THE firm of Martin Schilling in Leipzig announces three new sets of models:

By Professor M. WIEN, Jena: Series XLI, no. 2. Two pendula connected by an elastic spring. Price M 200. No. 3. Two pendula, one suspended on the other. Price M 46.

By Dr. W. KÖNIG, Giessen. Series XLI, no. 4. Thread model to illustrate astigmatism. Price M 75.

By Dr. H. SCHROEDER, Reformrealgymnasium, Halle. Series XLIII, nos. 1-7. Central surfaces of the quadric surfaces: elliptic paraboloid (three models); hyperbolic paraboloid (one model); ellipsoid (three models). Price M 110.

AT a recent session of the Paris academy of sciences the following prizes were awarded.

Poncelet prize (fr. 3000) to Professor MAURICE LEBLANC, for the totality of his researches in mechanics. Pontécoulant prize (fr. 1500) to Dr. SÜNDMAN for his contribution to the problem of three bodies. Binoux prize (fr. 2000) to Professor J. MOLK, of the University of Nancy, for his services to the French edition of the encyclopedia of mathematical sciences.

IN connection with the sixth international congress of mathematicians, to be held in Stockholm in 1916, King Gustav V of Sweden has founded a prize, consisting of a gold medal bearing a portrait of Weierstrass and a cash sum of 3000 crowns, for the best contribution to the theory of analytic functions. Either the general theory of analytic functions or any special branch of important analytic functions may be treated. Competing memoirs should be written in French, German, or English, and sent, under a pseudonym and motto, to the editors of the *Acta Mathematica* by October 31, 1915, the centenary of the birth of Weierstrass. All manuscripts

will be submitted to a jury consisting of the members of the first class of the Swedish academy of sciences, namely, Professors Mittag-Leffler, Falk, Phragmén, Wiman, Bendixson and von Kock, and Professor Fredholm by invitation.

The prize-winning memoir and others of high merit will be published in the *Acta*, and must not be published elsewhere.

THE Adams prize for 1914 will be awarded to the author of the best essay on the following theme:

“The phenomena of the disturbed motion of fluids, including the resistances encountered by bodies moving through them.”

The competition is open to any graduate of Cambridge University. The prize is £220.

ON May 25, 1913, Professor FELIX KLEIN, of the University of Göttingen, was presented by his former pupils with a portrait of himself and with a congratulatory letter. The portrait, painted by Max Liebermann, will appropriately adorn the wall of the mathematical institute of the University as soon as the building is completed.

PLANS have been completed for publishing the complete works of the late Henri Poincaré. The publication will be undertaken at once by Gauthier-Villars under the direction of the French minister of public instruction and the academy of sciences of Paris.

OWING to the mass of new material which has been found at St. Petersburg and at other places, the Euler commission realizes that it must face a deficit in the publication of Euler's works, unless further funds are provided. The publication of this new matter will necessitate several additional volumes and involve an unforeseen expense of at least \$40,000. To defray this expense it is proposed to form an Euler society, with dues of ten francs per year, the receipts of which are to be devoted entirely to this purpose.

THE annual list of American doctorates published in *Science* presents, for the academic year 1912–1913, 461 names, of which 231 are credited to the sciences. The following 19 successful candidates offered mathematics as major subject (the titles of the theses are appended): D. F. BARROW,

Harvard, "Oriented circles in space"; H. BATEMAN, Johns Hopkins, "The quartic curve and its inscribed configurations"; E. T. BELL, Columbia, "The cyclotomic quinary quintic"; Miss J. E. BURNS, Illinois, "The abstract definitions of the groups of degree eight"; G. R. CLEMENTS, Harvard, "Implicit functions defined by equations with vanishing Jacobian"; C. W. COBB, Michigan, "The asymptotic development for a certain integral function of zero order"; Miss L. P. COPELAND, Pennsylvania, "On the theory of invariants of plane n -lines"; W. A. COIT, Boston, "Introduction to modern geometry"; W. H. CRAMBLET, Yale, "On intermediate functions, being an extension of semi-continuous or upper and lower functions to a classification of discontinuous functions"; G. M. GREEN, Columbia, "Projective differential geometry of triple systems of surfaces"; R. A. JOHNSON, Harvard, "An analytic treatment of the conic as an element of space of three dimensions"; Miss F. P. LEWIS, Johns Hopkins, "A geometrical application of the theory of the binary quintic"; C. E. LOVE, Michigan, "The asymptotic solutions of linear differential equations"; Miss M. L. SANDERSON, Chicago, "Formal modular invariants with an application to binary modular covariants"; J. SLEPIAN, Harvard, "On the functions of a complex variable defined by an ordinary differential equation of the first order and the first degree"; L. L. SMAIL, Columbia, "Some generalizations in the theory of summable divergent series"; W. H. STONE, Boston, "The elements of harmonic ratio"; L. E. WEAR, Johns Hopkins, "On self-dual plane curves of the fourth order"; K. P. WILLIAMS, Princeton, "The solutions of non-homogeneous linear difference equations and their asymptotic form."

THE following advanced courses in mathematics (elementary courses not included) are offered at the Italian universities during the academic year 1913-1914:

UNIVERSITY OF BOLOGNA.—By Professor P. BURGATTI: Mathematical theory of elasticity, three hours.—By Professor L. DONATI: Thermodynamics in its relation to the electromagnetic field and especially to radiations, three hours.—By Professor F. ENRIQUES: Theory of algebraic functions, three hours.—By Professor L. PINCHERLE: Theory of functions of a real variable, Lebesgue's integral, the existence theorems;

elementary theory of the functions of a complex variable with applications to algebraic functions and their integrals, three hours.

UNIVERSITY OF CATANIA.—By Professor E. DANIELE: Electromagnetic field with special regard to the production of energy, three hours.—By Professor M. DE FRANCHIS: Geometry on algebraic curves from the transcendental point of view, four hours.—By Professor G. PENNACCHIETTI: Hydrodynamics, four hours.—By Professor C. SEVERINI: Advanced part of calculus, integral and integro-differential equations, four hours.

UNIVERSITY OF GENOA.—By Professor E. E. LEVI: Differential and integral equations, four hours.—By Professor G. LORIA: Pure synthetic geometry, three hours.—By Professor O. TEDONE: Selected chapters from the theories of potential and of integration of Laplace's equation, three hours.

UNIVERSITY OF NAPLES.—By Professor F. AMODEO: History of mathematics: The epoch of Newton and Leibniz, three hours.—By Professor A. DELRE: n -dimensional analysis of Grassmann with applications to geometry and mechanics, four and one-half hours.—By Professor R. MARCOLONGO: Analytic mechanics: algebraic integrals; problem of three bodies, three hours.—By Professor D. MONTESANO: Linear systems of surfaces; birational correspondences in space, four and one-half hours.—By Professor E. PASCAL: Selected chapters of analysis, differential equations, three hours.—By Professor L. PINTO: Propagation of heat, four and one-half hours.

UNIVERSITY OF PADUA.—By Professor F. D'ARCAIS: Functions of a complex variable, calculus of variations, four hours.—By Professor P. GAZZANIGA: Theory of numbers, three hours.—By Professor T. LEVI-CIVITA: Kinetic and statistic theories with application to quanta, four and one-half hours.—By Professor G. RICCI: Absolute differential calculus, potential, elasticity, four hours.—By Professor F. SEVERI: Differential geometry, four hours.—By Professor A. SIGNORINI: Elasticity with technical applications, three hours.—

By Professor G. VERONESE: Foundations of geometry, four hours.

UNIVERSITY OF PALERMO.—By Professor G. BAGNERA: Theory of automorphic functions, modular functions, three hours.—By Professor M. GEBBIA: Electricity and magnetism, four and one-half hours.—By Professor G. B. GUCCIA: General theory of algebraic curves and surfaces, four and one-half hours.—By Professor A. VENTURI: Potential, form of celestial bodies, elementary theory of the tides, four and one-half hours.

UNIVERSITY OF PAVIA.—By Professor L. BERZOLARI: Birational transformations in the plane and in the space with applications, three hours.—By Professor U. CISOTTI: Potential, propagation of heat, three hours.—By Professor F. GERBALDI: Functions of a complex variable, elliptic functions, three hours.—By Professor G. VIVANTI: Theory of transformation groups, three hours.

UNIVERSITY OF PISA.—By Professor E. BERTINI: Geometry on an algebraic curve, three hours.—By Professor L. BIANCHI: Curves, surfaces, and curved three-dimensional spaces, four and one-half hours.—By Professor U. DINI: Complements of infinitesimal analysis, integral equations, four and one-half hours.—By Professor G. A. MAGGI: Abstract of potential theory, formation and properties of the equations of elastic motion with application to theoretical optics, formation and properties of the equations of the electromagnetic field, electromagnetic theory of light, four and one-half hours.—By Professor P. PIZZETTI: Interpolation formulae, principles of spherical astronomy, mechanical theory of the shape of celestial bodies, four and one-half hours.

UNIVERSITY OF ROME.—By Professor L. AMOROSO: Theory of function of a complex variable and of elliptic functions, three hours.—By Professor G. BISCONCINI: Geometrical applications of infinitesimal analysis, three hours.—By Professor G. CASTELNUOVO: Topics having a bearing on elementary mathematics, abelian functions, three hours.—By Professor L. SILLA: Elasticity with technical applications, three hours.—By Professor V. VOLTERRA: Thermodynamics,

three hours.—Mechanical problems as application of the functions of lines and of their analysis, three hours.

UNIVERSITY OF TURIN.—By Professor T. BOGGIO: Analytic dynamics, three hours.—By Professor G. FUBINI: Ordinary differential equations, classic and recent results, three hours.—By Professor G. SANNIA: Ruled surfaces, investigation of congruences and complexes of rays by means of differential quadratic forms determining them, two hours.—By Professor C. SEGRE: Selected topics of hypergeometry, three hours.—By Professor C. SOMIGLIANA: Electricity and optics, three hours.

THE following courses are announced in mathematics for the winter semester 1913–1914:

UNIVERSITY OF BERLIN.—By Professor H. A. SCHWARZ: Analytic geometry, four hours; Synthetic geometry, four hours; Applications of elliptic functions, one hour; Colloquium, four hours; Seminar, two hours.—By Professor G. FROBENIUS: Theory of numbers, four hours; Seminar, two hours.—By Professor F. SCHOTTKY: Theory of elliptic functions, four hours; Theory of space curves and surfaces, four hours.—By Professor R. LEHMANN-FILHÉS: Integral calculus, four hours; Determinants, four hours.—By Professor G. HETTNER: Theory of probabilities, two hours.—By Professor J. KNOBLAUCH: Differential calculus, four hours; Elliptic functions, four hours; Quadrature of the circle, one hour.—By Dr. K. KNOPP: Theory of functions, II, four hours; Algebra, four hours.—By Professor O. KRIGAR-MENZEL: Mechanics of a particle, four hours.

UNIVERSITY OF BONN.—By Professor E. STUDY: Differential geometry, two hours; Higher geometry, one hour; Theory of functions, four hours; Seminar, two hours.—By Professor F. LONDON: Analytic geometry, four hours; Synthetic geometry, with exercises, three hours; Seminar, two hours.—By Professor I. SCHUR: Differential and integral calculus, four hours; Linear substitutions and elementary divisors, two hours.—By Dr. J. O. MÜLLER: Theory of determinants, two hours; Calculus of variations, three hours.

UNIVERSITY OF GÖTTINGEN.—By Professor D. HILBERT: Analytic mechanics, four hours; Electromagnetic oscillations, two hours.—By Professor W. VOIGT: Theory of the potential, four hours.—By Professor C. RUNGE: Differential and integral calculus, six hours; Mechanics of continua, two hours.—By Professor L. PRANDTL; Hydrodynamics, three hours.—By Professor E. LANDAU: Theory of numbers, four hours; Seminar, two hours.—By Professor C. CARATHÉODORY: Projective geometry, four hours; Conformal depiction, four hours; Seminar, two hours.—By Professor F. BERNSTEIN: Mathematical statistics and insurance, three hours; Theory of probabilities, three hours.—By Professor O. TOEPLITZ: Partial differential equations, four hours; Elementary mathematics, four hours.—By Dr. R. COURANT: Infinite series with applications, four hours.—By Dr. M. BORN: Elements of mathematical physics, four hours.—By Dr. E. HECKE: Historical development of the fundamental concepts of mathematics, two hours; Exercises in mechanics, two hours.—By Dr. L. v. SENDEN: Graphical statics, three hours; Vector analysis, two hours.

UNIVERSITY OF LEIPZIG.—By Professor K. ROHN: Analytic geometry of space, with exercises, five hours; Determinants, two hours; Seminar, two hours.—By Professor O. HÖLDER: Differential and integral calculus, with exercises, six hours; Partial differential equations, two hours; Seminar, two hours.—By Professor G. HERGLOTZ: Differential geometry, three hours; Mechanics, five hours; Seminar, two hours.—By Professor A. v. OETTINGEN: Geometric-perspective drawing, one hour.—By Professor P. KOEBE: Elliptic functions with applications, five hours; Seminar, two hours.—By Dr. R. KONIG; Higher algebra, two hours.

UNIVERSITY OF MUNICH.—By Professor F. LINDEMANN: Differential and integral calculus, five hours; Differential geometry, four hours; Geometry of the line and sphere, two hours; Seminar, two hours.—By Professor A. PRINGSHEIM: Foundations of arithmetic and analysis, four hours; Elliptic functions, four hours; Seminar, two hours.—By Professor A. VOSS; Algebra, four hours; Introduction to the theory of ordinary differential equations, four hours; Seminar, two hours.—By Professor F. HARTOGS: Descriptive geometry,

with exercises, seven hours; Trigonometry with applications, two hours.—By Professor H. BRUNN: Elements of higher mathematics, four hours.—By Dr. H. DINGLER: Elementary mathematics from a higher point of view, four hours; History of mathematics, two hours; Foundations of mathematics, two hours.—By Dr. F. BÖHM: Plane analytic geometry, four hours; Problems of life insurance, four hours; Life insurance companies, one hour.—By Dr. A. ROSENTHAL: Synthetic geometry, four hours; Proseminar, two hours.

UNIVERSITY OF STRASSBURG.—By ———: Differential and integral calculus, four hours.—By Professor F. SCHUR: Analytic geometry of the plane and of space, four hours; Selected chapters of differential geometry, two hours; Seminar, two hours.—By Professor M. SIMON: History of mathematics in antiquity, two hours.—By Professor J. WELLSTEIN: Introduction to the theory of functions and of elliptic functions, four hours.—By Professor R. v. MISES: Mechanics, I, four hours; Graphical and numerical methods of integration, two hours; Seminar, two hours.—By Professor S. EPSTEIN: Determinants and invariants, two hours.—By Dr. A. SPEISER: Fourier series, two hours.

PROFESSOR G. CANTOR, of the University of Halle, and Professor G. RODENBERG, of the technical school at Hannover, have been decorated with the order of the crown of the third class.

PROFESSOR M. DEHN, of the University of Kiel, has been appointed professor of mathematics at the technical school at Breslau.

DR. R. WEITZENBÖCK and DR. P. ROTH have been appointed docents in mathematics at the University of Vienna.

DR. E. STEINITZ has been appointed docent in mathematics at the University of Breslau.

DR. C. THAER has been appointed docent in mathematics at the University of Greifswald.

DR. L. BIEBERBACH, of the University of Königsberg, has

accepted a professorship of mathematics at the University of Bern.

DR. S. DUMAS, of the Swiss bureau of insurance, has been appointed associate professor of the mathematics of finance at the University of Lausanne.

DR. W. MATHIES, of the University of Münster, has been appointed professor of mathematical physics at the University of Basel.

DR. H. WEYL, of the University of Göttingen, has been appointed professor of higher mathematics at the technical school of Zurich, as successor to Professor C. F. GEISER, who has retired. DR. G. DUMAS has been promoted to an associate professorship of mathematics at Zurich.

PROFESSOR M. ABRAHAM, of the technical school at Milan, has been promoted to a full professorship of rational mechanics.

PROFESSOR G. SCORZA, of the University of Cagliari, has been transferred to the professorship of projective and descriptive geometry at the University of Parma.

DR. L. AMOROSO has been appointed docent in mathematics at the University of Rome.

DR. G. BORDIGA, of the University of Padua, has been promoted to an associate professorship of projective geometry.

DR. E. DANIELE, of the University of Pavia, has been appointed associate professor of mathematical physics at the University of Catania.

DR. L. TONELLI, of the University of Bologna, has been appointed associate professor of analysis at the University of Cagliari.

MR. S. B. McLAREN, lecturer of mathematics at the University College, Reading, has been appointed professor of mathematics at the same institution.

At the University of Chicago Professors G. A. BLISS and H. E. SLAUGHT have been promoted to full professorships of mathematics.

DR. N. J. LENNES, of Columbia University, has been appointed professor and head of the department of mathematics in the University of Montana.

At Stanford University, Professor H. F. BLICHFELDT has been promoted to a full professorship of mathematics and Professor W. A. MANNING has been promoted to an associate professorship of applied mathematics.

At the University of Oregon Dr. W. M. SMITH has been promoted to a full professorship of mathematics. Dr. R. M. WINGER, of the University of Illinois, has been appointed to an assistant professorship of mathematics.

At Northwestern University, Dr. E. J. MOULTON has been appointed assistant professor of mathematics. Dr. C. R. DINES and Mr. P. M. BACHELDER have been appointed instructors in mathematics.

DR. L. L. DINES, of Columbia University, has been appointed associate professor and acting head of the department of mathematics in the University of Arizona.

PROFESSOR F. ANDEREGG, of Oberlin College, has been granted a year's leave of absence to study in Europe.

DR. HENRY BLUMBERG has been appointed instructor in mathematics in the University of Nebraska.

PROFESSOR W. P. WEBBER, of Bethany College, has been appointed instructor in mathematics in the University of Pittsburgh.

DR. T. H. BROWN has been appointed instructor in mathematics at the Sheffield Scientific School of Yale University.

At the University of Minnesota Dr. W. E. ANDERSON, Dr. W. O. BEAL, and Dr. W. L. MISER have been appointed instructors in mathematics.

