

points at which further development of the theory is desirable. Its greatest value probably lies in the way in which it makes clear that it is desirable to have a further and deeper investigation of the properties of wave functions and the wave equation.

R. D. CARMICHAEL.

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NOTES.

THE Swiss mathematical society held its annual meeting at Geneva, September 12-15, in affiliation with the centenary celebration of the Helvetian society of natural scientists. The following papers were read: By Professor L. G. DU PASQUIER, "On systems of complex numbers"; by Dr. G. PÓLYA, "Is the non-continuation of a power series the general case?"; by Professor M. PLANCHEREL, "On the convergence of a remarkable class of definite integrals containing an arbitrary function"; by Dr. W. H. YOUNG and Dr. G. C. YOUNG, "Integration with regard to a function of limited variation"; by Dr. G. C. YOUNG, "On curves without tangents"; by Dr. K. MIRIMANOFF and Dr. G. C. YOUNG, "On the theorem of 'tuiles'"; by Professor L. J. CRELIER, "On a particular theorem of the geometry of motion"; by Professor R. DE SAUSSURE, "Geometry of leaflets"; by Professor CAILLER, "On the analytic theory of directed bodies"; by Dr. H. BERLINER, "A new projective analytic geometry"; by Professor L. KOLLROSS, "Concerning a duality"; by Dr. F. GONSETH, "Generalization of a theorem of Poncelet"; by E. GUILLAUME, "On the impossibility of reducing the law of divergence in several variables to a composite probability."

Professor M. GROSSMANN, of the technical school at Zurich, was elected president for the following year.

At a meeting of the Edinburgh mathematical society on November 12 the following papers were read: "The solution of difference equations by continued fractions," by J. A. STRANG; "A suggested measurement of relationship" and "The equation  $x^3 + y^3 + z^3 + u^3 = 0$  where  $x, y, z, u$  are rational," by J. E. A. STEGGALL; "Notes on a triangle," by G. E. CRAWFORD; "Easy geometrical proof of a theorem of Chasles," by E. PRESS.

THE Association of mathematics teachers of New Jersey held its third regular meeting at Stevens institute of technology on November 20. The programme included the following papers: "Mathematics and insurance," by P. C. H. PAPPS; "The proper functioning of a high school course in geometry," by R. T. LEVALLEY; "Review of Bourlet's Plane Geometry," by B. B. STRANG; "A high school course in strength of materials," by G. D. ORNER. Professor H. B. FINE is president of the association.

THE December number (volume 17, number 2) of the *Annals of Mathematics* contains the following papers: "The Cauchy definition of a definite integral," by D. C. GILLESPIE; "Surfaces with isothermal representation of their lines of curvature as envelopes of rolling," by L. P. EISENHART; "A theorem concerning real functions," by K. P. WILLIAMS; "Note on an operation of the third grade," by A. A. BENNETT; "Determination of all triply orthogonal systems containing a family of minimal surfaces," by T. H. GRONWALL.

THE May number of the *Proceedings of the National Academy of Sciences* contains the following mathematical papers: "A new canonical form of the elliptic integral," by BESSIE I. MILLER; "Transformations of conjugate systems with equal invariants," by L. P. EISENHART. The June number of the *Proceedings* contains: "Solution of an infinite system of differential equations of the analytic type," by F. R. MOULTON; "On the factorization of various types of expressions," by HENRY BLUMBERG. The July number contains: "On the representation of arbitrary functions by definite integrals," by W. B. FORD; "Some theorems connected with irrational numbers," by W. D. MACMILLAN. The August number contains "Seven points on a twisted cubic curve," by H. S. WHITE, and the October number contains "On isothermally conjugate nets of space curves," by G. M. GREEN.

THE Macmillan Company announces the publication of an Historical Introduction to Mathematical Literature, by G. A. MILLER.

THE firm of B. G. Teubner in Leipzig announces that the following works are in press: Euler's works, series 1, volume

2, part 1: *Commentationes arithmeticae*, by F. RUDIO; volume 18, part 2: *Commentationes analyticae ad theoriam integralium pertinentes*, by A. GUTZMER—Lie's collected memoirs, volume 3, by F. ENGEL—*Vorlesungen über Zahlen- und Funktionenlehre*, by A. PRINGSHEIM—The second part of the second volume of *Darstellende Geometrie*, by E. MÜLLER—*Theorie der elliptischen Funktionen*, by R. FRICKE—*Vorlesungen über reelle Funktionen*, by C. CARATHÉODORY—*Differential- und Integralrechnung*, by L. BIEBERBACH—*Les théories statistiques en thermodynamique*, by H. A. LORENTZ—*Partial differential equations of mathematical physics*, by A. G. WEBSTER—and a number of reports on the teaching of mathematics in Germany, edited by F. KLEIN.

THE following courses in mathematics are given during the present winter semester:

UNIVERSITY OF BERLIN.—By Professor H. A. SCHWARZ: Analytic geometry, four hours; Synthetic geometry, four hours; Elementary derivation of the most important properties of conics, two hours; Seminar, two hours.—By Professor G. FROBENIUS: Theory of numbers, four hours; Seminar, two hours.—By Professor F. SCHOTTKY: Theory of curves and surfaces, four hours; General problems of the theory of functions, two hours; Seminar, two hours.—By Dr. K. KNOPP: Ordinary differential equations, II, four hours; Theory of functions, II, with exercises, five hours.—By Professor R. ROTHE: Integral calculus, four hours.

UNIVERSITY OF BONN.—By Professor E. STUDY: Analytic geometry of two and of three dimensions, four hours; Seminar, two hours.—By Professor F. LONDON: Differential and integral calculus, with exercises, five hours; Synthetic geometry, with exercises, three hours; Seminar, two hours.—By Professor I. SCHUR: Selected chapters of analysis, two hours; Introduction to the theory of functions, four hours; Seminar, two hours.—By Dr. J. O. MÜLLER: Calculus of variations, three hours; Seminar, two hours.

UNIVERSITY OF GÖTTINGEN.—By Professor F. KLEIN: Development of mathematics in the nineteenth century, two hours.—By Professor D. HILBERT: Differential equations, four hours; Seminar, two hours.—By Professor C. RUNGE: Descriptive geometry, with exercises, five hours; Differential

and integral calculus, with exercises, six hours; Seminar, two hours.—By Professor E. LANDAU: Algebra, four hours; Seminar, two hours.—By Professor C. CARATHÉODORY: Curves and surfaces, four hours; Selected chapters from the theory of functions, with exercises, four hours.—By Professor F. BERNSTEIN: Mathematical statistics, two hours; Mathematics of insurance, two hours; Seminar, two hours.

UNIVERSITY OF LEIPZIG.—By Professor O. HÖLDER: Differential and integral calculus, five hours; Elliptic modular functions, two hours; Seminar, two hours.—By Professor K. ROHN: Analytic geometry of space, four hours; Differential geometry, four hours; Seminar, two hours.—By Professor G. HERGLOTZ: Mechanics, five hours; Selected chapters from the theory of numbers, three hours; Seminar, two hours.—By Dr. K. BLASCHKE: Partial differential equations, four hours; Conformal representation, two hours; Seminar, two hours.

UNIVERSITY OF STRASSBURG.—By Professor F. SCHUR: Analytic geometry of two and three dimensions, four hours; Selected chapters of differential geometry, two hours; Seminar, two hours.—By Professor G. FABER: Differential and integral calculus, four hours; Elliptic functions, two hours; Seminar, two hours.—By Professor M. SIMON: History of mathematics in ancient times, two hours.—By Professor J. WELLSTEIN: Graphical statics, three hours.—By Professor P. EPSTEIN: Analytic treatment of projective geometry, two hours.—By Dr. A. SPEISER: Perspective, two hours.

DR. J. RADON and Dr. F. RULF have been appointed docents in mathematics at the technical school of Vienna.

DR. W. SIMANDL has been appointed docent in projective geometry at the Bohemian technical school of Brünn.

DR. K. BOPP, of the University of Heidelberg, has been promoted to an associate professorship of mathematics.

PROFESSOR G. FABER, of the University of Strassburg, has been appointed to a full professorship in the technical school at Munich.

PROFESSOR P. PAINLEVÉ, of the University of Paris, has been appointed minister of education in the new French cabinet.

PROFESSOR E. PASCAL, of the University of Naples, has been awarded the medal of the Italian society of sciences (the forty).

PROFESSOR J. MOLLERUP has been appointed associate professor of mathematics in the University of Copenhagen, succeeding Professor H. BOHR, who has been called to the Copenhagen technical school as successor of the late Professor P. C. V. HANSEN.

DR. G. ARMELLINI, of the University of Rome, has been appointed associate professor of mechanics at the technical school of Turin.

PROFESSOR M. CIPOLLA, of the University of Catania, has been promoted to a full professorship of algebraic analysis.

DR. L. L. RIOS has been appointed docent in mechanics at the University of Padua.

THE two Benjamin Peirce instructorships in mathematics at Harvard University (see BULLETIN, volume 21, page 315) are again open to general competition. Applications for the year 1916-17, accompanied by the necessary papers, should reach Professor BÔCHER not later than February 1, 1916, who will be glad to furnish further particulars.

PROFESSOR N. C. GRIMES, formerly of the University of Arizona, has been appointed to a professorship of mathematics in the University of Oregon.

MISS GERTRUDE I. McCAIN has been appointed professor of mathematics in Oxford College, not in the Western College for Women as erroneously announced in the December BULLETIN. The professorship of mathematics in the Western College for Women is held by Miss HARRIET E. GLAZIER.

AT the State University of Kentucky associate professor J. M. DAVIS has been promoted to a full professorship of mathematics.

MISS A. D. LEWIS, of Mt. Holyoke College, has been appointed professor of mathematics and head of the department at the Kentucky College for Women.

At the Iowa State College the following changes have been made in the department of mathematics: Miss A. FLEMING has been promoted to an assistant professorship; Mr. J. R. SAGE, Miss F. FARNUM, and Miss M. MILLER have been appointed instructors; Miss N. MADSON has been appointed assistant.

PROFESSOR H. L. RIETZ, of the University of Illinois, has been appointed by Governor Dunne a member of the committee to investigate the operation of national and foreign pension systems.

PROFESSOR W. H. H. HUDSON, of King's College, London, died September 21, at the age of 76 years.

PROFESSOR E. JANISCH, of the technical school at Prague, died August 11, 1915, at the age of 46 years.

PROFESSOR J. KNOBLAUCH, of the University of Berlin, died July 22, 1915, at the age of 59 years.

PROFESSOR F. LECONTE, of the University of Ghent, died October 11, 1915, at the age of 50 years.

PROFESSOR H. GANTER, of the cantonal school at Aargau, died July 29, 1915, at the age of sixty-seven years.

DR. L. ORLANDO, of the University of Rome, was killed in battle in August.

DR. R. TORELLI, of the University of Pisa, was killed in battle August 10, 1915, at the age of thirty-one years.

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## NEW PUBLICATIONS.

### I. HIGHER MATHEMATICS.

BERZOLARI (L.). See ENCYCLOPÉDIE.

BESSEVE (A.). *Le cercle et les surfaces cerclées en géométrie conforme.* (Thèse.) Paris, Gauthier-Villars, 1915. 4to. 8+162 pp. Fr. 9.00

BÔCHER (M.). *Plane analytic geometry.* New York, Holt, 1915. 12mo. 13+235 pp. \$1.60

BROWN (E. H.). See BURN (J.).

BURN (J.) and BROWN (E. H.). *Elements of finite differences; also solutions to questions set for part 1 of the examinations of the Institute of actuaries.* London, Layton, 1915. 10s. 6d.