

parison of the results of theory and observation for a part of the Suez canal which communicates at one end with a tidal sea and at the other with small lakes: the differences are not greater than might have been expected.

Chapter IX will be read with interest by those who have taken the trouble to observe the eccentricities of the currents in a tidal river or estuary. Here it is mainly a question, not of the tides produced directly in the estuary by the sun and moon, but of the oscillations due to the rise and fall of the ocean at the mouth. The relation of the height of the water at any point of an estuary to the current at the same place is well and fully worked out. St. Venant's particular solution for a river of constant width and indefinitely prolonged towards the source, which gives the current as a function of the height only, receives considerable attention. The author shows how a defect in the practical application of it can be remedied by introducing friction; the calculations, however, become rather complicated. The chapter closes with the problem of a river whose width varies according to an exponential law. In Chapter X, under the heading of the solitary wave, the author treats standing waves and the propagation of a wave or hollow of given form; he follows the methods of Boussinesq entirely, omitting to mention some of the later investigations. The question of the stability of form of the wave is included.

The book, as a whole, is to be highly recommended and it will form a useful addition to the literature of hydrodynamics. The name of Gauthier-Villars is a sufficient indication of the excellence of the printing.

ERNEST W. BROWN.

NOTES.

BEGINNING with Volume XIII the *Annals of Mathematics* will be published under the auspices of Harvard University. A circular, about to be issued by the Department of Mathematics at Harvard, furnishes the following statement in regard to the conduct of the *Annale* under the new auspices:

"There has existed in this country for more than twenty years a journal (the *American Journal of Mathematics*) devoted almost exclusively to original research, and the *Transactions of the American Mathematical Society* will soon give still

further opportunity for the publication of research work of the highest order. On the other hand the BULLETIN has for eight years filled an important place as a historical and critical review. We do not wish that the *Annals* should encroach sensibly on either of these fields. We shall try to conduct this journal so that it may appeal not merely to the highly trained specialist, but to the general mathematical public of America, from students of mathematics in the graduate schools of our universities upward. If we are to accomplish this result it is essential that highly technical articles having no interest except for a small number of readers of the *Annals*, be avoided, however great their intrinsic value may be; especially as by far the most satisfactory place of publication for such articles is the *American Journal* or the *Transactions of the American Mathematical Society*. It is essential also that each number of the *Annals* should contain some variety, and this (in view of the limited number of pages we can print) will require us to exclude, as a general rule, long articles. We shall welcome short research articles written in such a way as to be intelligible to a considerable number of readers of the *Annals*.

“There is one class of articles which have not been wanting in the *Annals* in the past, and which we hope may be represented in the future to a still greater extent, namely articles which, while containing little or no absolutely new matter, give a clear presentation of some important but not readily accessible field of mathematics, or a more thorough presentation of some subject which is generally treated in an unsatisfactory manner. Such articles were numerous both in France and in Italy during recent periods of mathematical revival in those countries, and might, we believe, do much to help the healthy growth of mathematical thought in America, as they surely did in the countries just mentioned.

“We expect to publish the *Annals* quarterly beginning with the first of next October. Professor ORMOND STONE of the University of Virginia, who founded and for many years supported the *Annals*, has consented to act as a member of the board of editors. The other members of the board will be Professor H. S. WHITE, of Northwestern University, and Professors BYERLY, OSGOOD, and BÔCHER, of Harvard University.”

THE following courses in mathematical subjects have been announced at various German universities for the summer semester of 1899 :

UNIVERSITY OF BERLIN.—By Professor G. FROBENIUS : Analytical geometry, four hours ; Theory of algebraic equations, four hours ; Seminar, two hours.—By Professor R. LEHMANN-FILHÉS : Differential calculus, four hours ; Exercises in differential calculus, one hour.—By Professor H. A. SCHWARZ : Integral calculus, four hours ; Theory of analytical functions, four hours ; Exercises in integral calculus, two hours ; Mathematical colloquia, two hours ; Seminar, two hours.—By Professor E. R. HOPPE : Integral calculus, four hours ; Analytical mechanics, four hours.—By Professor G. HETTNER : Theory of definite integrals, two hours.—By Professor K. HENSEL : Higher arithmetic, four hours ; Geometry of numbers and the theory of algebraic units, two hours.—By Professor J. KNOBLAUCH : Theory of elliptic functions, four hours ; Surfaces of constant curvature, one hour ; Analytical mechanics, four hours.—By Professor L. FUCHS : Application of the theory of elliptic functions, four hours ; Introduction to the theory, which is not changed by linear substitutions of the variables, four hours ; Seminar, two hours.—By Professor J. BAUSCHINGER : Theory of orbits of comets and planets, three hours ; Correction of the astronomical constants, one hour ; Interpolation and mechanical quadratures, one and a-half hours ; Seminar for scientific computing.—By Professor W. FÖRSTER : Astrometry, four hours ; History of astronomy, two hours ; Seminar for scientific computing.—By Professor R. HELMERT : Method of least squares, two hours ; Determination of the figure of the earth, two hours.

UNIVERSITY OF BONN.—By Professor L. HEFFTER : Differential equations, lectures three hours, exercises one hour ; Descriptive geometry, five hours.—By Professor H. KORTUM : Elliptic functions, four hours ; Infinite series, two hours ; Mathematical seminar, two hours.—By Professor R. LIPSCHITZ : Elements of the infinitesimal calculus, four hours ; Exercises in seminar, two hours.—By Professor H. LORBERG : Theory of potential, two hours.—By Dr. A. PFLÜGER : Maxwell's theory, one hour.

UNIVERSITY OF ERLANGEN.—By Professor P. GORDAN : Invariants, four hours ; Theory of numbers, four hours ; Exercises in seminar, three hours.—By Professor M. NÖTHER : Infinitesimal calculus, four hours ; Descriptive geometry, two hours ; Selected chapters of analytical mechanics, two hours ; Mathematical exercises.

UNIVERSITY OF GIESSEN.—By Professor M. PASCH : Plane analytical geometry, four hours ; Infinite series, two

hours ; Seminar, two hours.—By Professor E. NETTO : Elements of algebra, four hours ; Theory of numbers, two hours ; Mathematical seminar, two hours.—By Professor R. HAUSSNER : Invariant theory, two hours ; Perspective, two hours ; Theory of probabilities, one hour.

UNIVERSITY OF GÖTTINGEN.—By Professor E. RICKE : Selected problems in acoustics, one hour.—By Professor W. VOIGT : Selected chapters in hydrodynamics, one hour.—By Professor F. KLEIN : Automorphic functions, four hours ; Mathematical seminar, in conjunction with Hilbert, two hours.—By Professor W. SCHUR : Theory of orbits, special perturbations, four hours ; Method of least squares, one hour ; Seminar, one hour.—By Professor D. HILBERT : Differential calculus, four hours ; Selected chapters from the theory of groups, two hours ; Calculus of variations, two hours ; Seminar, theory of functions of a real variable, two hours.—By Professor E. WIECHERT : Theory of probabilities, two hours.—By Professor G. BOHLMANN : Analytical geometry, four hours ; Seminar in insurance, two hours.

UNIVERSITY OF GREIFSWALD.—By Professor W. THOMÉ : Integral calculus, four hours ; Elliptic functions, four hours ; Mathematical seminar, two hours.—By Professor E. STUDY : Mechanics, four hours ; Selected sections of geometry, three hours ; Seminar, one hour.

UNIVERSITY OF HALLE-WITTENBERG.—By Professor G. CANTOR : Trigonometrical series, one hour ; Infinitesimal calculus, five hours ; Exercises in seminar, two hours.—By Professor A. WANGERIN : Selected chapters in celestial mechanics, one hour ; Differential equations, three hours ; Theory of potential and spherical harmonics, five hours ; Exercises in seminar, two hours.—By Professor V. EBERHARD : Exercises in analytical geometry, one hour ; Analytical geometry of the plane and of space, four hours.—By Dr. A. GUTZMER : Theory of functions, three hours.

UNIVERSITY OF KIEL.—By Professor L. POCHHAMMER : Introduction to the theory of numbers, four hours ; Selected chapters from the theory of functions, four hours ; Seminar, one hour.—By Professor L. WEBER : Theory of potential, four hours.—By Professor P. HARZER : Selected chapters in celestial mechanics, three hours ; Calculus of differences, two hours.—By Professor H. KREUTZ : Theoretical astronomy, four hours.—By Professor P. STÄCKEL : Differential calculus, three hours ; Introduction to the theory of differential equations, two hours ; Integration of the differential equations of mechanics, four hours ; Seminar, one hour.

UNIVERSITY OF KÖNIGSBERG.—By Professor P. VOLK-MANN: Introduction to theoretical physics, especially to analytical mechanics, four hours.—By Professor H. STRUVE: Determination of planetary and cometary orbits, three hours.—By Professor F. MEYER: Exercises in differential calculus, one hour; Differential calculus with applications to geometry, four hours; Introduction to the theory of functions of a complex variable, four hours; Exercises in the theory of functions, one hour.—By Professor L. SAAL-SCHÜTZ: Technical mechanics, two hours; Exercises in the theory of definite integrals and other parts of the integral calculus, one hour; Theory of definite integrals, three hours.—By Dr. T. VAHLEN: Arithmetical theory of quadratic forms, two hours.

UNIVERSITY OF LEIPZIG.—By Professor A. MAYER: General introduction to the theory of ordinary differential equations four hours; Exercises in ordinary differential equations, one hour.—By Professor C. NEUMANN: Selected chapters in constructive geometry, two hours; Theory of potential, two hours; Seminar, one hour.—By Professor H. BRUNS: General astronomy and mathematical geography, two hours; Method of least squares, two hours; Seminar, two hours.—By Professor O. HÖLDER: Substitution theory and algebraic equations, four hours; Determinants, one hour; Exercises in determinants and theory of equations, two hours. By Professor F. ENGEL: Plane and solid analytical geometry, four hours; Non-euclidean geometry, two hours; Seminar, one hour.—By Professor P. DRUDE: Theory of heat, four hours.—By Dr. F. HAUSDORFF: Theory of curves and surfaces, four hours; Complex numbers and vectors, two hours.

UNIVERSITY OF STRASSBURG.—By Professor T. REYE: Theory of forces which obey Newton's law, three hours; Selected chapters from the higher synthetic geometry, three hours; Mathematical seminar, two hours.—By Professor H. WEBER: Calculus of variations, four hours; Encyclopædia of elementary mathematics, two hours; Seminar in conjunction with Wellstein.—By Professor G. ROTH: Infinitesimal calculus, three hours; Plane analytical geometry, two hours.—By Professor E. COHN: Theory of heat, three hours.—By Professor A. KRASER: Definite integrals three hours; Solid analytical geometry, three hours; Descriptive geometry, two hours.—By Dr. E. TIMERDING: Geometry of the circle and sphere, two hours.—By Dr. J. WELLSTEIN: Introduction to the theory of algebraic functions, two hours.

UNIVERSITY OF VIENNA.—By Professor G. v. ESCHERICH : Theory of functions, five hours ; Seminar, two hours ; Proseminar, one hour ; Theory of probabilities, three hours.—By Professor L. GEGENBAUER : Elements of the infinitesimal calculus, five hours ; Exercises in the preceding course, two hours ; Proseminar, one hour ; Seminar, two hours.—By Professor F. MERTENS : Theory of numbers, five hours ; Mathematical statistics, three hours ; Seminar, two hours ; Proseminar, one hour.—By Professor G. KOHN : Synthetic geometry, four hours ; Exercises in synthetic geometry, one hour.—By Dr. V. SERSAWY : Lectures on the mathematics of insurance, three hours. By Dr. A. TAUBER : Elements of descriptive geometry, three hours ; Mathematics of insurance, four hours ; Exercises on the preceding course, two hours.—By Dr. K. ZINDLER : Differential geometry of space curves, one hour ; Introduction to H. Schubert's Calculus of enumerative geometry, one hour.—By Dr. E. BLASCHKE : Introduction to mathematical statistics, two hours.—Dr. K. ZSIGMONDY : Eulerian integrals, one hour ; Surfaces of second order, one hour.—By Dr. R. D. v. STERNECK : Prime numbers, one hour ; Theory of complex numbers composed of roots of unity, one hour.

THE proposal to place in Corsock Parish Church, by half-guinea subscriptions, a memorial window in memory of Professor JAMES CLERK MAXWELL has already been referred to in these columns. We learn from *Nature* that, to complete the window, forty pounds sterling more will be required. Subscriptions may be sent to Reverend George Sturrock, The Manse, Corsock, by Dalbeattie, N. B.

PROFESSOR G. BOHLMANN has prepared for the sixth volume (1899) of the proceedings of the German mathematical association a report on the most important text-books on the infinitesimal calculus from Euler to the present time.

THE *Revue scientifique* of date March 25th, 1899, contains articles on l'Enseignement des mathématiques, by M. E. DUCLAUX, and on l'Initiation mathématique, by M. LAISANT.

THE first number of the current volume (the second) of the *Bolletino di bibliografia e storia delle scienze matematiche* has a bibliographical article by R. BONOLA on the foundations of geometry in relation to the non-euclidean geometry.

PROFESSOR J. BOUSSINESQ contributes a memoir on the theory of the bicycle to the last number (the first number of the fifteenth volume) of *Liouville's Journal*, and Mr. F.

J. W. WHIPPLE describes the stability of a bicycle's motion in the March number of the *Quarterly Journal of pure and applied mathematics*.

DR. F. ENGEL has been promoted to the rank of ordinary honorary professor at the University of Leipzig, and Dr. G. SCHEFFERS has received the same title at the Technische Hochschule of Darmstadt. Dr. A. GUTZMER, of Halle, has been made assistant professor of mathematics at the University of Jena.

DR. C. E. ST. JOHN has been elected professor of physics and astronomy in Oberlin College. Dr. M. B. PORTER, of the University of Texas, has been appointed instructor in mathematics at Yale University.

DR. L. E. DICKSON has been promoted to an assistant professorship of mathematics at the University of California.

NEW PUBLICATIONS.

I. HIGHER MATHEMATICS.

BAIRE (R.). Sur les fonctions de variables réelles. [Diss.] Milan, Bernardoni de C. Rebeschini, 1899. 4to. 123 pp.

BOHLMANN (G.). Uebersicht über die wichtigsten Lehrbücher der Infinitesimalrechnung (Jahresbericht der Deutschen Mathematiker-Vereinigung, Band VI.).

— See SERRET (J. A.).

BORTOLOTTI (E.). Sulla convergenza degli algoritmi periodici e sulla risoluzione approssimata delle equazioni algebriche. Bologna, Civelli, 1898. 8vo. 13 pp.

BRODÉN (T.). Ueber Grenzwerte der Reihenquotienten. Stockholm, 1897. 8vo. 49 pp. M. 2.40

BUCHHOLZ (A.). Ein Beitrag zur Mannigfaltigkeitslehre. Mannigfaltigkeiten, deren Linienelemente auf die Form

$$ds = f(\sqrt{\sum x_k^2}) \sqrt{\sum dx_k^2}$$

gebracht werden können. Bonn, 1899. 8vo. 6 and 264 pp. M. 7.00

ENGEL (F.). See LOBATSCHESKIJ (N. J.).

FRANZ (C.). Untersuchungen über die lineare homogene Differentialgleichungen zweiter Ordnung der Fuchs'schen Klasse mit drei im Endlichen gelegenen singulären Stellen. [Diss.] Berlin, Mayer and Müller, 1898. 4to. 39 pp. M. 2.00

HARNACK (A.). See SERRET (J. A.).

KORNAKOFF (W.). Deformation of plane surfaces. St. Petersburg, 1898. 8vo. 110 pp. (Russian.) M. 3.00