the memoirs themselves should serve admirably to give to the
reader a comprehensive idea of these classic methods in mathe-
matical physics, and of the leading lines of development to
which they have given rise. To all interested in these subjects
this translation will come as a welcome publication in separate
form of a pair of memoirs, somewhat inaccessible to the general
reader, and yet without which the work table of the student of
mathematical physics or of physical chemistry can scarcely
seem well furnished.

<div align="right">W. F. DURAND.</div>

## NOTES.

THE twelfth summer meeting of the AMERICAN MATHE-
MATICAL SOCIETY will be held at Williams College, Williams-
town, Mass., on Thursday and Friday, September 7–8. Titles
and abstracts of papers intended for presentation at this meet-
ing should be in the hands of the Secretary as early as Aug-
ust 20.

THE April number (volume 6, number 2) of the *Trans-
actions* of the AMERICAN MATHEMATICAL SOCIETY contains
the following papers : "General projective theory of space
curves," by E. J. WILCZYNSKI ; "Sur les opérations linéaires
(deuxième note)," by MAURICE FRÉCHET ; Surfaces whose
geodesics may be represented in the plane by parabolas,"
by EDWARD KASNER ; "The doubly periodic solutions of
Poisson's equation in two independent variables," by MAX
MASON ; "Definition in terms of order alone in the linear con-
tinuum and in well ordered sets," by OSWALD VEBLEN ; "On
the structure of hypercomplex number systems," by SAUL
EPSTEEN and J. H. MACLAGAN-WEDDERBURN ; "On a defi-
nition of abstract groups," by E. H. MOORE ; "Note on the
definitions of abstract groups and fields by sets of independent
postulates," by E. V. HUNTINGTON ; "Definitions of a group
and a field by independent postulates," by L. E. DICKSON ;
"On semigroups and the general isomorphism between finite
groups," by L. E. DICKSON ; "A set of postulates for ordinary
complex algebra," by E. V. HUNTINGTON ; "On imprimitive
linear homogeneous groups," by H. F. BLICHFELDT.

THE April number (volume 6, number 3) of the *Annals of Mathematics* contains: "Groups of the fundamental operations of arithmetic," by G. A. MILLER; "Linear differential equations with discontinuous coefficients," by M. BOCHER; "Some physical solutions of the general equation of the $n$th degree," by R. E. MORITZ; "The ballistic problem," by F. GILMAN; "A theorem concerning uniform convergence," by G. D. BIRKHOFF.

THE April number (volume 27, number 2) of the *American Journal of Mathematics* contains: "On a class of differential equations," by A. CHESSIN; "Surfaces with the same spherical representation of their lines of curvature as pseudo-spherical surfaces," by L. P. EISENHART; "On the forms of sextic scrolls having no rectilinear directrix," by V. Snyder; "Determination of the ternary modular group," by L. E. DICKSON.

AT the meeting of the London mathematical society held on March 9, the following papers were read: By Mr. H. BATEMAN, "On the Weddle quartic surface"; by Professor M. T. M. HILL, Dr. L. N. G. FILON, and Mr. H. W. CHAPMAN, "On projective relations between two planes"; by Mr. P. W. WOOD, "On the theory of perpetuants."

THE annual meeting of the Deutsche Mathematiker-Vereinigung will be held at Meran, in the Tyrol, September 24 to 30, under the presidency of Professor P. STÄCKEL. While contributions to any branch of mathematics will be welcome, special reports will be given on higher arithmetic, geometry, and the partial differential equations of mathematical physics. The meeting will be affiliated with the seventy-seventh annual meeting of German naturalists and physicians. Papers intended for this meeting should be sent to the secretary, Professor Dr. A. KRAZER, Karlsruhe, Westendstrasse 57, as soon as possible.

A regular meeting of the Association of Ohio teachers of mathematics and science was held at Ohio State University, Columbus, March 25, 1905. A general session was held in the morning, followed by sectional sessions in the afternoon. The following papers were presented in the section of mathematics: "What is to be done with the high school pupil who is unable to master demonstrative geometry? Shall students who fail only in mathematics be permitted to graduate?" by T. L.

Feeney; "How to teach rational geometry," by G. B. Halsted; "Apparatus illustrating elementary trigonometric functions," by W. H. Wilson; "Methods of teaching elementary algebra," by T. M. Focke. The Association's annual dues of one dollar and a half include a subscription to *School Science and Mathematics*. The officers elected are : President, W. McPherson, Ohio State University; vice-president, F. P. Jones, University School, Cleveland; secretary, T. E. McKinney, Marietta College.

THE Association of teachers of mathematics in the Middle States and Maryland held its second annual meeting at Teachers College, New York City, on Saturday, April 22. About fifty members were in attendance. Professor E. S. Crawley presided at the morning and afternoon sessions. The following papers were read : "The educational value of mathematics," by W. H. Metzler; "Some of the logical difficulties of modern euclidean geometry," by T. K. Brown; "Method of teaching pupils to do original work in plane geometry," by E. R. Smith. The association now includes 297 members.

THE Missouri Society of teachers of mathematics held its first annual meeting at the University of Missouri, on May 6. The following papers were announced on the preliminary programme : "Correlation of arithmetic, algebra, geometry, and trigonometry," by E. Y. Burton; "An experiment in individual instruction," by William Schuyler; "A method of teaching elementary geometry," by G. R. Dean; "The teaching of mathematics in the high school," by J. W. Withers; "Some developments in elementary algebra," by F. C. Touton.

A GENERAL conference of associations of teachers of mathematics will be held at Asbury Park, N. J., on July 5, in connection with the meeting of the National Educational Association. The purpose of the conference is to consider all common interests of the associations and, in general, questions connected with the teaching of elementary mathematics in the United States.

THE Open Court Publishing Company, of Chicago, has just issued a portfolio of twelve portraits of eminent mathematicians, edited by Professor D. E. SMITH. It includes the portraits of Descartes, Pythagoras, Archimedes, Fermat, Leonardo of Pisa, Euclid, Cardan, Leibniz, Napier, Vieta, Newton and Thales.

The portraits are prepared by a photographic process, and are issued in two forms, the first on Japanese paper, the price being $5.00, and the second on plate paper, at $3.00. The originals are from Professor Smith's large collection. With each portrait is a biographical note introducing a brief bibliography.

THE firm of Gauthier-Villars, in Paris, announces that the fourth volume of E. PICARD's Traité d'analyse and volumes 2 and 3 of H. POINCARÉ's Leçons de mécanique céleste are in the press.

B. G. TEUBNER has in press a treatise on Projective differential geometry of curves and ruled surfaces, by E. J. WILCZYNSKI.

THE firm of M. Schilling, in Halle, announces a model (series 30, number 4) of the limiting surface of a parabolic (linear) congruence. The surface is of order six, has a four-fold line and two consecutive biplanar points. Only two of the sheets through the four-fold lines are real. The surface can be generated by the motion of a variable circle. The model, which is of plaster, 68 × 38 × 7 cm., was constructed by Professor K. ZINDLER, of Innsbruck.

The following advanced courses in mathematics are announced for the year 1905–1906 :

HARVARD UNIVERSITY. — By Professor J. M. PEIRCE: † Introduction to higher plane curves; The calculus of quaternions (first course); Tetrahedral coördinates of points, lines, and planes, the linear complex; † The calculus of finite differences; † Linear associative algebra. — By Professors BYERLY and B. O. PEIRCE: Trigonometric series, introduction to spherical harmonics, the potential function. — By Professor B. O. PEIRCE: Methods in mathematical physics. — By Professor OSGOOD: † Infinite series and products; † Riemann's theory of functions. — By Professor BÔCHER: † The properties of polynomials, invariants; Introductory course in the theory of functions; † Definite integrals and integral equations. — By Professor BOUTON: † The elementary theory of differential equations; Geometric transformations, with special reference to the work of Sophus Lie. — By Mr. WHITTEMORE: † Celestial mechanics; † Differential geometry. — By Dr.

COOLIDGE: Non-euclidean geometry. — By Dr. HUNTINGTON:
† The fundamental concepts of mathematics.

These courses will involve three lectures a week throughout
the year, except those preceded by †, which involve about half
this number of lectures.   Furthermore, courses in reading and
research are offered by Professor J. M. PEIRCE, on Algebraic
plane curves; by Professor BYERLY, on Recent contributions
to ellipsoidal harmonic analysis; by Professor BÔCHER, on
Fluctuating functions; by Professor BOUTON, on Topics in the
theory of continuous groups; by Mr. WHITTEMORE, on
Goursat's Cours d'analyse; and by Dr. COOLIDGE, on Topics
in higher geometry. — The mathematical conference will meet
as usual.

YALE UNIVERSITY. — By Professor BEEBE: Celestial me-
chanics, two hours. — By Professor J. PIERPONT: Elliptic
functions, two hours; Functions of a real variable, two hours;
Functions of a complex variable, two hours; Analytic geom-
etry, two hours; Theory of aggregates, one hour. — By Profes-
sor P. F. SMITH: Continuous groups of transformations, two
hours. — By Professor H. E. HAWKES: Algebra, two hours,
Advanced algebra, two hours; Teachers course in geometry;
two hours; Differential equations, one hour. — By Dr. W. A.
GRANVILLE: Differential geometry, two hours. — By Dr. E.
B. WILSON: Advanced calculus, two hours; Analytic me-
chanics, two hours; Theoretical mechanics, two hours. — By
Dr. C. M. MASON: Partial differential equations, two hours;
Functional equations, one hour. — By Dr. D. R. CURTISS:
Harmonic analysis, two hours; Taylor's series and analytic
continuation, one hour. — By MR. TAYLOR: Scientific compu-
tation, one hour.

THE various foreign universities offer courses in mathematics
during the summer semester of 1905 as follows:

OXFORD UNIVERSITY (Easter and Trinity terms). — By
Professor W. ESSON: Comparison of analytic and synthetic
methods in the geometry of conics, two hours; Informal in-
struction in geometry, one hour.— By Professor E. B. ELLIOTT:
Theory of functions, three hours. — By Professor A. E. H.
LOVE: Theory of sound, two hours. — By Mr. J. W. RUSSELL:
Algebra of quantics, II, one hour. — By Mr. A. L. DIXON:
Calculus of variations, one hour. — By Mr. J. E. CAMPBELL:

Applications of moving axes to solid geometry, one hour. —
By Mr. H. T. GERRANS: Line geometry, two hours. — By
A. E. JOLLIFFE: Higher analytic plane geometry, two hours.
— By Mr. P. J. KIRBY: Higher plane curves, two hours. —
By Mr. R. F. McNEILE: Series and continued fractions, two
hours. — By Mr. C. H. THOMPSON: Differential equations, two
hours. — By Mr. C. E. HASELFOOT: Geometric optics, two
hours.

UNIVERSITY OF GIESSEN. — By Professor M. PASCH: Ele-
ments of higher mathematics, I, four hours; with exercises,
two hours; Seminar, one hour. — By Professor E. NETTO:
Algebra, four hours; Differential geometry, four hours; Semi-
nar, one hour. — By Professor H. GRASSMANN: Ordinary dif-
ferential equations, with exercises, three hours; Descriptive
geometry, II, with exercises, four hours.

UNIVERSITY OF GREIFSWALD. — By Professor W. THOMÉ:
Integral calculus, four hours; Theory of algebraic surfaces and
twisted curves, two hours; Seminar, two hours. — By Professor
F. ENGEL: Theory of functions, II, four hours; Theory of
transformation groups, four hours; Differential geometry, one
hour; Seminar, two hours. — By Professor K. TH. VAHLEN:
Analytic geometry, three hours; with exercises, two hours;
Descriptive geometry, two hours.

UNIVERSITY OF MÜNSTER. — By Professor W. KILLING:
Differential and integral calculus, I, four hours; with exercises,
one hour; Theory of numbers, three hours; Seminar, two
hours. — By Professor R. V. LILIENTHAL: Analytic geometry,
I, four hours; Partial differential equations, four hours; Semi-
nar, one hour. — By Dr. M. DEHN: Synthetic geometry, four
hours; Calculus of variations, three hours.

UNIVERSITY OF ROSTOCK. — By Professor O. STAUDE:
Plane analytic geometry, four hours; Analytic mechanics, four
hours; Exercises in descriptive geometry, two hours.

UNIVERSITY OF STRASSBURG. — By Professor T. REYE:
Selected chapters of higher synthetic geometry, three hours;
Theory of forces, three hours; Seminar, two hours. — By Pro-
fessor H. WEBER: Definite integrals and introduction to the
theory of functions, four hours; Calculus of variations, three
hours; Seminar, two hours. — By Professor J. WELLSTEIN:

Abelian functions, four hours; Riemann surfaces, one hour. —
By Professor M. DISTELI : Analytic geometry of space, three
hours; with exercises, one hour; Descriptive geometry, II,
with exercises, four hours. — By Professor M. SIMON : Methods
of elementary arithmetic in connection with algebraic analysis,
two hours; Noneuclidean geometry, one hour. — By Dr. P.
EPSTEIN : Vector analysis, two hours.

UNIVERSITY OF TÜBINGEN. — By Professor A. V. BRILL :
Analytic geometry of space, three hours; Theory of curvature
of surfaces, four hours; with exercises, two hours. — By Pro-
fessor H. V. STAHL : Lower analysis, three hours; with exer-
cises, one hour; Higher analysis, three hours; with exercises,
one hour. — By Professor L. MAURER : Theory of functions,
three hours; with exercises, one hour; Descriptive geometry,
two hours.

UNIVERSITY OF BASEL. — By Professor H. KINKELIN :
Differential and integral calculus, II, three hours; Differential
equations, three hours; Plane analytic geometry, three hours. —
By Professor O. SPIESS : Introduction to the theory of func-
tions, two hours; Algebra, three hours.

UNIVERSITY OF LAUSANNE. — By Professor M. AMSTERIS :
Differential and integral calculus, five hours; with exercises,
two hours; Theory of elliptic functions, three hours; Definite
integrals and infinite series, two hours. — By Professor H.
JOLY : Analytic geometry, II, two hours; Descriptive geo-
metry, II, six hours; Theory of algebraic curves, two hours.
— By Professor O. MAYOR : Rational mechanics, I, four hours;
with exercises, one hour; Rational mechanics, II, two hours —
By Dr. C. JACCOTTET : Theory of potential, two hours.

ACADEMY OF NEUCHÂTEL. — By Professor L. ISELY ; Ap-
plications of the calculus, three hours; Analytic geometry of
quadric surfaces, two hours. — By Professor L. GABEREL :
Determinants and quadratic forms, one hour; Mechanics, two
hours.

UNIVERSITY OF ZÜRICH. — By Professor H. BURKHARDT :
Differential and integral calculus, II, four hours; Elliptic
functions, four hours; Seminar, two hours. — By Professor A.
WEILER : Analytic geometry, with exercises, two hours; De-
scriptive geometry, with exercises, three hours; Mathematical
geography, three hours; Political arithmetic, two hours.

THE division of mathematics and physics of the Royal Society of Naples has awarded its prize of 1000 lire to Professor E. PASCAL for his memoir on the theory of invariants of the ternary quartic with special reference to the conditions for splitting into inferior forms. The society now offers a prize of 500 lire for the best memoir on the theory of electrons and dispersion of light. Competing essays must be written in Italian, French or Latin and be received by the secretary before June 30, 1906.

A COMMITTEE has been formed to secure funds for the erection, at Bourg-en-Bresse, of a monument to J. J. LALANDE, on the occasion of the centenary of his death. Subscriptions may be sent to the treasurer, N. Huteau, 20 boulevard Victor Hugo, Bourg-en-Bresse (Ain), France.

PROFESSOR R. LEHMANN-FILHÉS, of the University of Berlin, has been decorated with the order of the red eagle of the fourth class.

PROFESSOR F. SCHILLING, of the new technical school at Danzig has been appointed professor of geometry at the technical school of Charlottenburg-Berlin.

PROFESSOR M. CANTOR, of the University of Heidelberg, has been elected honorary member of the Royal society of Edinburg.

PROFESSOR K. ZSIGMONDY, of the technical school at Vienna, has been appointed professor of mathematics at the German technical school of Prague.

DR. KARL STÖCHL has been appointed professor of mathematics and physics at Passau.

DR. C. CARATHÉODORY has been appointed docent in mathematics at the University of Göttingen.

PROFESSORS W. F. MEYER and A. SCHOENFLIES, of the University of Königsberg, have been made corresponding members of the Royal society of sciences at Liège.

DR. JAROLIMEK has been appointed docent in geometry at the Bohemian technical school at Brünn.

AT the recent convocation of the University of Edinburg, the honorary degree of doctor of laws was conferred upon

Professor G. A. GIBSON, of the Glasgow and West of Scotland technical college.

DR. EDWARD KASNER has been promoted to an instructorship in mathematics in Barnard College, Columbia University.

MR. W. H. ROEVER has been appointed instructor in mathematics at the Massachusetts Institute of Technology.

PROFESSOR C. G. ROCKWOOD, of Princeton University, has retired from active service.

PROFESSOR E. W. BROWN will spend the summer in South Africa as a member of the official party of the British association for the advancement of science, which has arranged for an extended tour through the South African colonies in connection with the meetings at Cape Town and Johannesburg. During Professor Brown's absence, from June 15 to October 30, all correspondence relating to the *Transactions* should be addressed to one of the other members of the Editorial Committee.

PROFESSOR E. B. VAN VLECK, of Wesleyan University, has received leave of absence and will spend the coming year abroad.

PROFESSOR L. W. DOWLING, of the University of Wisconsin, has been granted leave of absence for the coming academic year, which he will spend mainly in Italy.

BLOOMFIELD J. MILLER, vice-president and actuary of the Mutual Benefit Insurance Company of Newark, died in that city on April 11. Mr. Miller had been a member of the AMERICAN MATHEMATICAL SOCIETY since 1891.

DR. DAVID MURRAY, professor of mathematics at Princeton University 1863 to 1873, and for several years adviser of the imperial minister of education of Japan, died March 21, at the age of 75 years.

RECENT catalogues of second-hand mathematical works : Henry Sotheran and Company, 37 Piccadilly, London W., catalogue 650, 1687 titles of mathematical, physical and chemical books ; Gustav Fock, Schlossgasse 7–9, Leipzig, catalogue of the most important sets of journals and encyclopedias in the field of exact science, about 850 titles ; A. Hermann, rue de la

Sorbonne 6, Paris V, catalogue 83, part 1, 2430 titles in mathematics, letters A to H, and 170 sets of mathematical periodicals; Nicola Zanichelli, Bologna, catalogue 29, 278 titles in mathematics and physics; K. F. Kochler, 6 Kurprinzstrasse, Leipzig, Antiquariats-Katalog 564, 3004 titles in mathematics.

# NEW PUBLICATIONS.

## I. HIGHER MATHEMATICS.

APPELL (P.). Éléments d'analyse mathématique à l'usage des ingénieurs et des physiciens. 2e édition. Paris, Gauthier-Villars, 1905. 8vo. 7 + 714 pp. Fr. 24.00

AGUGLIA (G.). La curva $\Phi_1^\kappa$, relativa ad un sistema lineare $\infty^\kappa$ e le sue applicazioni ad una teoria sintetica delle curve polari. Memoria di geometria pura. Palermo, 1904. 8vo. 75 pp. Fr. 3.00

BASSETT (A. B.). An elementary treatise on cubic and quartic curves. New York, Macmillan, 1905. 8vo. 16 + 255 pp. Cloth. $4.25

BATH (W.). Zur Theorie der gleichzeitig-hyperbolischen Schnitte der Oberflächen 2. Ordnung. (Diss.) Rostock, Leopold, 1904. 8vo. 190 pp. M. 1.50

DARBOUX (G.). A study of the development of geometric methods. Translated by G. B. Halsted. 8vo. 23 pp. (*Popular Science Monthly*, March, 1905).

FLEET (R. R.). Ueber die Quadraturen von Integralen partieller Differentialgleichungen. (Diss.) Heidelberg, 1904. 8vo. 36 pp.

GARBIERI (G.). Teoria dei determinanti. Torino, 1904. 8vo. 32 pp. Fr. 2.00

GULDBERG (A.). Sur les communs multiples des expressions linéaires aux différences finies. 1905. 8vo. 6 pp. (*Rendiconti del Circolo matematico di Palermo*, Vol 29.)

——. Ueber lineare homogene Differenzengleichungen derselben Art. Warsaw, Sikorski, 1905. 8vo. 9 pp. (*Prace matematyczno-fizyczne*, Vol. 16.)

——. Ueber lineare homogene Differenzengleichungen. Leipzig, Teubner, 1905. (*Archiv der Mathematik und Physik* (3) 8.) 8vo. 4 pp.

HALSTED (G. B.). See DARBOUX (G.).

HERMITE (C.). See LAGUERRE (E.).

JOLY (C. J.). Manual of quaternions. London, Macmillan, 1905. 8vo. 348 pp. Cloth. 10s.

JUEL (C.). Stereometri og analytisk geometri til brug i tekniske skoler. Udgivet paa foranstaltning of det tekniske Selskabs Skole. Kopenhagen, 1895. 8vo. 84 pp. Kr. 2.00

LAGUERRE (E.). Oeuvres, publiées sous les auspices de l'Académie des Sciences, par C. Hermite, H. Poincaré et E. Rouché. Vol. II: Géométrie. Paris, Gauthier-Villars, 1905. 8vo. Fr. 22.00