order $p^2$. If it is abelian, its order must be of the form $p^m$ and its type must be $(1, 1, 1, \cdots)$.*

Dickson has found a new system of simple groups by the study for modulus 2 of a linear group on 7 variables which he had investigated before for fields not having this modulus. The problem for modulus 2 required a different analysis and led to a simple group of order $2^{6q}(2^{6q} - 1)(2^{2q} - 1)$, $q > 1$. For $q = 1$ the group has a simple subgroup of index 2 and of order 6048.† The following theorem is frequently useful in the study of simple groups, especially if they are represented as substitution groups. If $p^\alpha$ is the highest power of the prime $p$ which divides the order of a simple group $K$ and if $K$ contains less than $(p + 1)^2$ subgroups of order $p^\alpha$, then each of these Sylow subgroups is transformed into itself by a maximal subgroup of $K$.‡

In view of the fundamental importance of Sylow's theorem we add the following new statement of it, even though this statement can be readily derived from the one usually given. If the order of a group $G$ is $p^\alpha m$, $p$ being any prime which does not divide $m$, $G$ contains at least one subgroup $P_\alpha$ of order $p^\alpha$. Moreover if $P_\alpha$ contains only one subgroup $P_\beta$ of a given type, then all the subgroups of this type are conjugate under $G$ and their number is of the form $1 + kp$. The order of $G$ may be written in the form $p^\beta n(1 + kp)$, $p^\beta n$ being the order of the largest subgroup which transforms $P_\beta$ into itself.§ By letting $\beta = \alpha$ we obtain an ordinary form of this theorem.

(*To be continued.*)

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## NOTES.

THE concluding (October) number of volume 29 of the *American Journal of Mathematics* contains the following papers : " On twisted quintic curves," by E. C. COLPITTS ; " Attraction of the homogeneous spherical segment," by G. W. HILL ; " On a certain class of algebraic translation surfaces," by J. EIESLAND ; " Group characters of various types of linear groups," by H. E. JORDAN.

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* BULLETIN, vol. 12 (1906), p. 446.
† Dickson, *Mathematische Annalen*, vol. 60 (1905), p. 137.
‡ *Comptes rendus*, vol. 136 (1903), p. 294.
§ *Annals of Mathematics*, vol. 5 (1904), p. 187.

THE fifty-seventh annual meeting of the American association for the advancement of science will be held at Chicago, December 30 to January 4, 1908, under the presidency of Professor E. L. NICHOLS, of Cornell University. Professor E. O. LOVETT is vice-president and chairman of section A (mathematics and astronomy) and Professor L. G. WELD is secretary. The address before Section A by the retiring vice-president, Professor EDWARD KASNER, will be on "Geometry and mechanics."

THE royal academy of sciences of Madrid announces the following prize problem for the year 1908 :

" A concise exposition of the fundamental principles of nomography which are strictly necessary for the composition of a system of abaci or nomograms, as yet unknown and applicable with manifest advantage over any other procedure to the resolution of a series of questions, interesting in theory and useful in practice, referring to the physical and mathematical sciences."

The prize will be awarded in three classes. The first class, or prize proper, consists of a diploma of award, a gold medal, a money prize of 1500 pesetas, and a hundred reprints of the successful memoir for the author. The second prize consists of a diploma, a gold medal, and a hundred reprints. The third prize is a diploma. Competing memoirs must be written in Spanish or Latin and sent to the Secretaria de la Academia, 36 calle de Valverde, Madrid, before December 31, 1908.

THE late Dr. P. WOLFSKEHL, of Darmstadt, left the sum of 100,000 marks to the academy of sciences of Göttingen, to be awarded to the person who first presents a rigorous proof of the celebrated Fermat theorem : " The equation $x^n + y^n = z^n$ $(n > 2)$ can never be satisfied by integers." Until this end has been attained, the interest on this sum is to be applied to mathematical purposes at the discretion of the academy.

THE time for submitting papers in competition for the Guccia prize (see BULLETIN, volume 11, page 167) expired July first. Three memoirs were received, bearing the titles : " Sur les courbes gauches de direction " (234 pages); " Sur quelques propriétés arithmétiques des courbes algébriques planes ou gauches " (16 pages) ; " Grundlage zu einer Bewegungstheorie des Kreises und der Kugel " (45 pages). On the sixth of July another memoir was received, bearing the title " Ueber die Uniformisierung beliebiger algebraischer Kurven " (70 pages),

but under the rules of the competition it could not be accepted. The result of the competition is to be announced at one of the sessions of the fourth international congress of mathematicians at Rome next April.

THE Hamburg mathematical society, founded in 1690, chiefly by the efforts of its first president, Heinrich Meissner, consisted at the time of its organization of six resident and nine non-resident members, and assumed the title "Kunstrechnung-sübende Societät." That the society had a higher purpose than the solution of riddles is shown by the fact that it has continued in activity over two hundred years; it is the oldest mathematical society extant, and the oldest scientific society of Germany, except the Leopold-Carolus academy of Halle, which was founded in 1652. Its publications consisted at first of an annual letter or report and various subsidized books written by prominent members, the most important of which was the Mathematisches Sinnenconfect, written by P. Halcke in 1719. In the latter half of the eighteenth century over half the members resided in Holland; owing to the inconvenience of attending the monthly meetings at Hamburg, these members were largely influential in organizing the mathematical society of Amsterdam in 1778. From the time of the French revolution until the Franco-Prussian war, the chief activity of the society was the cultivation of applied mathematics, and most of its members were engineers, but since 1870 more interest has been shown in the broader view of mathematics. In 1873 an autographed abstract of the papers read before the society was appended to the yearly report and sent to all members. This proved so useful that it was continued until 1881, at which time the first number of the *Mitteilungen* was issued. The society now has over 60 members and possesses a substantial library. Although its influence has not been widely extended, yet the Hamburg mathematical society has been a most potent factor in maintaining a high standard of excellence in the schools of the city.

THE *Annuario* of the Circolo mathematico di Palermo issued in September, contains in addition to the usual alphabetic list of its members, a chronological list containing both former and present members distinguished by different type, a list of all the other learned societies to which any members belong, and the names of all such members in each, a similar list of univer-

sities and other institutions, and finally, a list of periodicals whose editorial staff includes one or more members of the Circolo. The society has 511 members, of whom 81 are Americans. During the year 1906 the membership increased by 107.

The Circolo has undertaken to publish the mathematical works and scientific correspondence of Paolo Ruffini, including the Theoria generale delle equazioni, which appeared at Bologna in 1799. The necessary funds have been generously provided by Professor G. B. GUCCIA, director of the *Rendiconti*.

The following university courses in mathematics are announced :

CAMBRIDGE UNIVERSITY. *Michaelmas term*, beginning October 14. — By Professor A. R. FORSYTH : Differential geometry, three hours. — By Professor G. H. DARWIN : Dynamical astronomy, three hours. — By Professor Sir R. S. BALL : Planetary theory, three hours. — By Professor J. LARMOR : Electricity and magnetism, three hours. — By Dr. E. W. HOBSON : Spherical harmonics and allied functions, three hours. — By Dr. H. F. BAKER : Introduction to the theory of functions, three hours, Theory of groups, three hours. — By Mr. B. A. HERMAN : Hydrodynamics, three hours. — By Mr. H. W. Richmond : Analytic geometry, three hours. — By Dr. A. N. WHITEHEAD : Principles of mathematics, three hours ; Non-euclidean geometry, three hours. — By Mr E. W. BARNES : Linear differential equations, three hours.— By Mr. A. MUNRO : Hydrodynamics and sound, three hours.— By Mr. J. H. GRACE : Invariants and geometric applications, three hours.— *Lent term*, beginning January 16, 1908. — By Professor A. R. FORSYTH : Differential geometry, three hours. — By Professor G. H. DARWIN : Figure of the earth, three hours. — By Professor J. LARMOR : Electrodynamics with optical applications, three hours. — By Dr. E. W. HOBSON : Differential equations and expansions of mathematical physics, three hours. — By Dr. H. F. BAKER : Solid geometry, three hours ; Theory of functions, three hours. — By Mr. B. A. HERMAN : Hydrodynamics, three hours.— By Mr. H. W. RICHMOND : Analytic geometry, three hours. — By Dr. A. N. WHITEHEAD : Principles of mathematics, three hours ; Non-euclidean geometry, three hours. — By Mr. E. W. BARNES : Hypergeometric series, three hours. — By Mr. A. BERRY : Elliptic functions, Bessel functions and Fourier series, three hours.— By Mr. C. T. BENNETT : Line

geometry, three hours.— By Mr. A. YOUNG : Theory of invari-
ants, three hours ; Discontinuous groups, three hours. *Easter
term,* beginning April 27, 1908.— By Professor A. R. FORSYTH :
Differential geometry, three hours.— By Professor J. LARMOR :
Theory of gases, three hours. — By Dr. H. F. BAKER : Theory
of functions, three hours. — By Mr. B. A. Herman : Hydro-
dynamics, three hours. — By Mr. H. W. RICHMOND : Projec-
tive geometry, three hours.— By Dr. A. N. WHITEHEAD : Non-
euclidean geometry, three hours.— By Mr. A. BERRY : Elliptic
functions, three hours. — By Mr. A. MUNRO : Line geometry,
three hours. — By Mr. G. H. HARDY : Integral functions,
three hours.

UNIVERSITY OF VIENNA. *Winter Semester.* — By Professor
G. v. ESCHERICH : Introduction to the theory of functions,
five hours ; Seminar, three hours. — By Professor F. MER-
TENS : Algebra, five hours ; Seminar, three hours. — By Pro-
fessor W. WIRTINGER : Calculus, five hours ; Seminar, three
hours. — By Professor G. KOHN : Analytic geometry, four
hours ; Differential geometry, two hours. — By Professor E.
BLASCHKE : Introduction to the mathematics of statistics, three
hours. — By Professor K. CARDA : Infinite groups, two hours.
— By Dr. J. PLEMELJ : Theory of numbers, three hours. — By
Dr. H. HAHN : Foundations of geometry, two hours. — By
Dr. L. HANNI : Theoretic arithmetic, two hours — By Dr. L.
SCHRUTKA : Finite discrete groups, two hours.

THE October number (volume 16, number 9) of the *Jahres-
bericht der deutschen Mathematiker - Vereinigung* contains an
interesting abstract of the scheme of old age and disability pen-
sions of full professors in the German universities and technical
schools.

THE works of the Japanese mathematician SEKI, a contem-
porary of Newton, entitled Shichibusho (Seven Books), are soon
to appear in one volume under the auspices of the Tokio Mathe-
matico-Physical Society, in commemoration of the two hun-
dredth anniversary of the death of this noted scholar.

BARON D. KIKUCHI, formerly professor of mathematics in
the Imperial University of Tokio, returned to that city on
September 14 after a trip around the world during which he
gave a number of addresses in England. The baron is chair-
man of a committee which is about to undertake the work of
compiling a history of native Japanese algebra.

THE following have been elected honorary members of the London mathematical society: Professor G. CASTELNUOVO, of the University of Rome, Dr. G. W. HILL, of New York, Professor C. JORDAN, of the College of France, Professor V. VOLTERRA, of the University of Rome.

THE following mathematicians have been decorated by the German emperor: Professor D. HILBERT, of the University of Göttingen, with the order of the crown of the third class; Professor W. KIEPERT, of the technical school of Hanover, with the order of the crown of the second class; Professor R. v. LILIENTHAL, of the University of Münster, with the order of the red eagle of the fourth class; Professor W. KILLING, of the University of Münster, with the order of the crown of the third class.

PROFESSOR A. R. FORSYTH, of the University of Cambridge, received the honorary degree of doctor of laws at the 25-year jubilee of the University of Liverpool.

DR. M. ABRAHAM, of the University of Göttingen, has been promoted to an associate professorship of mathematics.

DR. G. HERGLOTZ, of the University of Göttingen, has declined the call to the University of Freiburg, Switzerland.

DR. M. FRÉCHET, of the lycée at Besançon, has been appointed professor of special mathematics at the lycée at Nantes.

DR. G. NITALI has been appointed docent in mathematics at the University of Genoa.

PROFESSOR G. LAURICELLA, of the University of Catania, has been elected a corresponding member of the Accademia dei Lincei at Rome.

PROFESSOR D. A. MURRAY, of Dalhousie College, has been appointed to the chair of applied mathematics at McGill University, as successor to the late Professor G. H. Chandler.

MR. MURRAY MACNEILL, assistant professor of mathematics at McGill University, has been appointed professor of mathematics at Dalhousie College.

PROFESSOR E. H. MOORE, of the University of Chicago, will spend most of the present academic year in Italy, leaving New York about New Year's and returning in October.

PROFESSOR A. N. SKINNER, of the U. S. Naval Observatory, has retired under the age limit from his position as professor of mathematics. MR. H. L. RICE has been appointed his successor.

AT Brown University, Professor N. F. DAVIS has been granted a year's leave of absence. DR. R. G. D. RICHARDSON, recently of Yale University, has been appointed assistant professor of mathematics, and DR. H. H. CONOVER, also recently of Yale, has been appointed instructor in mathematics.

MR. FLOYD FIELD has been appointed junior professor of mathematics at the Georgia School of Technology.

DR. B. L. NEWKIRK, of the Lick Observatory, has been appointed assistant professor of mathematics and mechanics in the University of Minnesota.

AT Iowa College, Grinnell, Ia., Dr. R. B. McCLENON has been promoted to an assistant professorship of mathematics; Mr. R. E. HAWLEY has been appointed instructor in mathematics.

MR. J. D. SUTER and MR. E. JORDAN have been appointed instructors in mathematics at Stanford University.

The following academic appointments are also announced: Mr. J. B. REYNOLDS, instructor in mathematics at Lehigh University; Mr. G. R. CLEMENTS, instructor in mathematics at Williams College; Mr. J. W. MITCHELL, instructor in mathematics at the Agricultural College of Texas; Mr. R. B. STONE, instructor in mathematics at Bowdoin College; Mr. — BREWSTER and Mr. — COOK, tutors in mathematics at the College of the City of New York; Miss M. E. WELLS has resumed her instructorship at Mount Holyoke College.

Catalogues of second-hand mathematical books: G. E. Stechert and Co., 129 West 20th Street, New York, catalogue 18, exact sciences, including journals, 98 pages. — A. Hermann, 6 rue de la Sorbonne, Paris, catalogue 89, journals, mathematics, astronomy and geodesy, 2064 titles; catalogue of theses, 100 entries in mathematics and astronomy.