PROCEEDINGS
OF THE
LONDON MATHEMATICAL SOCIETY.

VOL. XI.

SIXTEENTH SESSION, 1879-80.

November 13th, 1879.

ANNUAL GENERAL MEETING, held at 22, Albemarle Street.

C. W. MERRIFIELD, Esq., F.R.S., President in the Chair.

The Treasurer (S. Roberts, Esq., F.R.S.) read his Report, which, on the motion of Mr. Terry, seconded by Lieut.-Col. J. R. Campbell, was accepted.

At the request of the Chairman, Mr. R. F. Scott consented to act as Auditor.

The Secretaries' Report was read and adopted.

From the Report of the Secretaries, it appeared that the number of Members during the past Session had increased from 137 to 141, and that the Society had lost by death Prof. W. K. Clifford, F.R.S., Sir John George Shaw Lefevre, F.R.S., and Prof. J. Clerk Maxwell, F.R.S.

The communications made to the Society during the past Session had been as follows:—

“On the Instability of Jets:” Lord Rayleigh, F.R.S.

“On Self-strained Frames of Six joints:” Prof. Crofton, F.R.S.

“On Equivalent Statements, (iii.):” Mr. H. McColl.

“On Forms of Numbers determined by Continued Fractions:”
Mr. S. Roberts, F.R.S.

“A Graphic Construction of the Powers of a Linear Substitution:”
Prince Camille de Polignac.

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- "On a Theorem in Elliptic Functions:" Prof. Cayley, F.R.S.
- "Coefficients of Induction and Capacity of two Electrified Spheres:" Prof. A. G. Greenhill, M.A.
- "On certain Systems of Partial Differential Equations of the First Order with several Dependent Variables:" Mr. H. W. Lloyd Tanner, M.A.
- "On the number of Conics which satisfy Five Independent Conditions:" M. Halphen.
- "On a Modular Equation, and on the Formula for Four Abelian Functions answering to the Formula for Four Theta Functions:" Prof. H. J. S. Smith, F.R.S.
- "Quaternion Proof of Minding's Theorem:" Mr. J. J. Walker, M.A.
- "On Differential Equations, Total and Partial; and on a new solvable class of the first and an exceptional case of the second:" Sir J. Cockle, F.R.S.
- "Discussion of Two Double Series arising from the Number of Terms in Determinants of certain Forms:" Mr. J. D. H. Dickson, M.A.
- "Notes on Quantics of Alternate Numbers, used as a means for determining the Invariants and Covariants of Quantics in general:" the late Prof. Clifford, F.R.S.
- "On the Complex whose lines join Conjugate Points of two Correlative Planes:" Dr. Hirst, F.R.S.
- "On a Theorem relating to conformable Figures:" Prof. Cayley, F.R.S.
- "Method of Constructing, by Pure Analysis, Functions X , Y , &c., which possess the property that $\int XY d\sigma = 0$, and such that any given Function can be expanded in the form $\alpha X + \beta Y + \gamma Z + \dots$:" Mr. Routh, F.R.S.
- "The Numerical Calculation of a Class of Determinants, and a Continued Fraction:" Mr. J. D. H. Dickson, M.A.
- "Notes on the Reduction of a System of Forces and on Plane Curves:" Mr. J. J. Walker, M.A.
- "Notes on Determinants of n Dimensions:" Mr. Lloyd Tanner, M.A.
- "On Clifford's Graphs, and on the Twenty-one Coordinates of a Conic in Space:" Dr. Spottiswoode, P.R.S.
- "Déduction de différents Théorèmes Géométriques d'un seul Principe Algébrique:" Dr. H. G. Zeuthen.

Besides the above, several minor communications were made to the Society.

Cartes-de-visite likenesses of Mr. C. W. Merrifield, F.R.S., President, and of Mr. S. Roberts, F.R.S., Treasurer, had been presented to the Society's Album.

The same Journals had been subscribed for as in the preceding Session.

The following additions had been made to the number of Journals for which the Society exchanges its Proceedings:—

“The American Journal of Pure and Applied Mathematics;” Baltimore.

“Archives Néerlandaises des Sciences exactes et naturelles, publiées par la Société Hollandaise des Sciences à Harlem;” La Haye.

“Beiblätter zu den Annalen der Physik und Chemie;” Leipzig.

The Meeting then proceeded to the election of the New Council. The Scrutators (Messrs. Lloyd Tanner and McAlister), having examined the balloting lists, declared the following gentlemen duly elected:—

President, C. W. Merrifield, F.R.S.; Vice-Presidents, Prof. Cayley, F.R.S., and Lord Rayleigh, F.R.S.; Treasurer, S. Roberts, F.R.S.; Honorary Secretaries, M. Jenkins, M.A., and R. Tucker, M.A.; other Members, J. W. L. Glaisher, F.R.S., H. Hart, M.A., Dr. Henrici, F.R.S., Dr. Hirst, F.R.S., Dr. Hopkinson, F.R.S., A. B. Kempe, B.A., C. Leudesdorf, M.A., H. W. Lloyd Tanner, M.A., H. M. Taylor, M.A., and J. J. Walker, M.A.

The President briefly alluded to the losses the Society had sustained in the past Session by the deaths of Prof. Clifford, Sir J. G. Shaw Lefevre, and Prof. J. Clerk Maxwell.

A vote of thanks was passed to Mrs. Clifford for the present of four volumes from her late husband's library.

Mr. R. C. Rowe, B.A., was elected a Member of the Society.

The following communications were made to the Society:—

“On the Binomial Equation $x^n - 1 = 0$; Trisection and Quartisection:” Prof. Cayley.

“On Cubic Determinants and other Determinants of Higher Class, and on Determinants of Alternate Numbers:” Mr. R. F. Scott.

“On a Problem of Fibonacci's:” Mr. S. Roberts.

“Notes on a Class of Definite Integrals:” Mr. T. R. Terry.

The following presents were received:—

“Monatsbericht,” Juli, August, 1879.

“Beiblätter zu den Annalen der Physik und Chemie,” Leipzig, 1879, Band iii., Stück ii.

“Nautical Almanac” for 1883: from Lords Commissioners of Admiralty.

“Cours de Géométrie descriptive de l'Ecole Polytechnique, comprenant les éléments de la Géométrie Cinématique,” par A. Mannheim; Paris, 1880: from the Author.

“Washington Observations for 1871.” Appendix i.—“Zones of Stars observed at the United States Naval Observatory with the

Meridian Circle in the years 1847, 1848, and 1849;" Washington, 1873.

"Washington Observations for 1869." Appendix ii.—"Zones of Stars observed . . . with the Mural Circle, in the years 1846—1849," (2 copies); Washington, 1872.

"Washington Observations for 1872." Appendix i.—"Tables of Instrumental Constants and Corrections for the Reduction of Transit Observations made at the United States Naval Observatory;" Washington, 1873.

"Washington Observations for 1870." Appendix iii.—"On the Right Ascension of the Equatorial Fundamental Stars, and the Corrections necessary to reduce the Right Ascensions of different Catalogues to a mean Homogeneous System," by Simon Newcomb; Washington, 1872.

"Washington Observations for 1870." Appendix i.—"Report on the Difference of Longitude between Washington and St. Lewis," by Prof. W. Harkness; Washington, 1872.

"Washington Observations for 1872." Appendix ii.—"Report on the Difference of Longitude between Washington and Detroit, Michigan; Carlin, Nevada; and Austin, Nevada," by J. R. Eastman; Washington, 1879.

"Washington Observations for 1868." Appendix i.—"A Catalogue of 1963 Stars, and of 290 Double Stars observed by the United States Naval Astronomical Expedition to the Southern Hemisphere, during the years 1850—1852."

On the Binomial Equation $x^p - 1 = 0$; Trisection and Quartisection. By PROF. CAYLEY.

[Read November 13th, 1879.]

The solution of the binomial equation $x^p - 1 = 0$, p a prime number, or, say rather, the equation

$$x^{p-1} + x^{p-2} \dots + x + 1 = 0,$$

depends upon the Jacobian function

$$Fa = x^1 + ax^g \dots + a^{p-2} x^{g^{p-2}},$$

where g is a prime root of p , a any root whatever of the equation $w^{p-1} - 1 = 0$. Taking e a factor of $p-1$, and f for the complementary