positive. Dr. H. B. Heywood inquired if Prof. Moore had discovered any similar results for quadratic forms other than positive ones. Such results would be of use in the theory of Fredholm's equations. Prof. Moore thought Mr. Hilton's suggestion a good one. He had not discovered any results applicable to the general quadratic form. He had been led to the theorem of his paper by his work on Fredholm's equation.

Prof. J. C. Fields gave a new proof of a general theorem relating to orders of coincidence. Major MacMahon discussed the algebraic functions derived from the permutations of any assemblage of objects. Prof. W. Peddie described an apparatus for the solution of equations of the *n*th degree, which required, however, that the equation should be prepared so that the root required lay between 0 and 1. In reply to a query, he thought that the method would be more expeditious than those usually employed.

Dr. H. B. Heywood described the use of the exponential curve in graphics. For carrying out the processes a template of transparent celluloid is used upon which is marked a graduated exponential curve. Operations of multiplication, division, evolution, differentiation, and integration are performed. The error is not greater than 1 per cent. except for differentiation.

An account was given by Dr. Nicholson of the report of the committee for the tabulation of Bessel and other functions. Four sheets of new tables of elliptic functions are given for four modular angles. These are preceded by a statement by Sir George Greenhill explaining the notation and the mode of using the tables. The report includes some tables (placed at their disposal by Prof. A. G. Webster, who has calculated them) of some *ber* and *bei* functions and their derivatives. These tables will be of especial importance to electrical engineering.

Cosmical Physics and Astronomy.

The report of the committee on seismological investigations contains a detailed account of the various seismic disturbances in the period 1904–09, thus extending the catalogue contained in last year's report. Curves are given, relating to six large earthquakes, showing the relation between the amplitudes in angular measure and the distance from the origin. Sixteen instances are given in which the azimuth of an origin determined from the maxima of the N.S. and E.W. motion approximately agrees with the azimuth as measured on a globe. In the same interval there are twenty-six instances for which no such agreement exists. The inference is that the main portion of teleseismic motion generally takes place in directions independent of the azimuth of its origin. Sections are devoted to the relative duration of two rectangular components of earth movement at a given station, megaseismic frequency in different seasons, earthquake periodicity, a new periodicity (by Prof. H. H. Turner, in which it is shown that besides the period of about fifteen months, there is also evidence that for the world as a whole seismic strain usually finds relief every fifteen or thirty days), and other matters.

Prof. H. H. Turner explained further to the section that further examination showed that some of the deviations may be due to the existence of neighbouring periodicities which have not been fully examined. But attention has been concentrated on the existence of pairs of periodicities or groups (analogous to double lines or groups of spectra) by relative work on the variations of level and azimuth of the Greenwich and Cape transit circles.

In the absence of Mr. J. I. Craig, Prof. Turner read a paper by the former showing that there is a connection between Prof. Schuster's method of analysing a series of figures for suspected periodicities and the method of correlation applied by Prof. Karl Pearson to detect hidden connections between sets of variables.

Dr. S. Chapman, of Greenwich Observatory, gave an account of an attempt to determine the total number of the stars. He also read a paper by Prof. Dyson (the Astronomer Royal) in which it was endeavoured to identify several chromosphere lines as due to radium. Considerable scepticism seemed to be shown by those present whether it was possible at present to make sure of the identity on such short spectra as are obtainable. Prof. Kayser expressed his great interest, but considered that the relative intensities which had been quoted were very uncertain because authorities differed. It was doubtful indeed whether a stated intensity had any meaning. The presence of helium seemed to be a point in favour of the author. Prof. the Hon. R. J. Strutt remarked that the spectral examination of terrestrial minerals would scarcely show the presence of radium, and asked whether the conditions in the chromosphere were such as to enhance the lines or those of allied bodies, such as barium. Prof. Rutherford said he would require very great evidence indeed before accepting spectroscopic evidence of emanation in stars. Dr. Nicholson argued that the presence of helium does not prove the presence of radium. Father Cortie and Dr. Lockyer both emphasised the shortness of the spectra.

In a paper on magnetic disturbances, sun-spots, and the sun's corona, Father Cortie examined the curves for the period 1898–1911 of mean daily disc-area of sun-spots, mean daily range of declination and horizontal force, and yearly numbers of great and moderate magnetic disturbances. There is a general accord in the curves, but also notable discrepancies. For example, the rapid fall of sun-spot curve 1909–11 was accompanied by a marked rise in declination, horizontal force and moderate magnetic disturbances.

The committee on magnetic observations at Falmouth Observatory report the following mean values of the magnetic elements for the year 1911 :—

Declination	17° 33·0′ W.
Inclination	66° 28·2′ N.
Horizontal force	0·18798 C.G.S.
Vertical force	0·43172.

The meteorological papers read have been described in an earlier article (November 28, p. 369).

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Notice is given that the Plumian professorship of astronomy and experimental philosophy is vacant by the death of Sir George H. Darwin, K.C.B.

Mr. H. C. Robson, of Sidney Sussex College, has been appointed chairman of the examiners for the mathematical tripos, part i., 1913, and Prof. Seward chairman of the examiners for the natural sciences tripos, 1913.

The professor of anatomy has appointed Mr. E. R. T. Clarkson an additional demonstrator of anatomy.

The matriculation of December 6 shows a total entry of 1156 freshmen up to the present date for the year 1912–13. This compares favourably with the similar number of last year at the same date, which was 1111.

OXFORD.—On December 10 the honorary degree of doctor of science was conferred on Prof. Ernest

William Hobson, fellow of Christ's College, and Sadlerian professor of pure mathematics in the University of Cambridge.

By special invitation of the University of Calcutta, Dr. A. R. Forsyth, F.R.S., will give a course of advanced lectures in pure mathematics early next year. His subject is "The Theory of Functions of Two or More Complex Variables." The course will consist of sixteen lectures, to be delivered late in January and in February, and the lectures will be published later.

The course of lectures on Indian sociology by Mr. T. C. Hodson will be resumed at East London College (University of London), Mile End Road, E., on Monday, January 13, at 5.30 p.m., when the subject-matter of the lectures will be tree marriage in India, its significance in non-Aryan races, and other forms of substituted marriage. These lectures are free to the public.

The Selborne Society is making a representative exhibit at the Children's Welfare Exhibition (which is to be opened at Olympia on December 31), to show what is best in nature-study and its uses to boys and girls. All who are interested in the subject are invited to communicate with Mr. Wilfred Mark Webb, 42 Bloomsbury Square, W.C., so that he may send them the outline scheme which it is intended more particularly to follow and learn what matters of value they could offer to illustrate it.

In view of the success of the first Summer School of Town Planning, held at the Hampstead Garden Suburb in August last, under the auspices of the University of London, it has been decided to hold a second summer school next year at the same centre. It will last for a fortnight, commencing August 2, and continuing until August 16, and during that time lectures and demonstrations on town planning and subjects practically connected therewith will be given by some of the leading authorities. Particulars can be obtained upon application to the hon. secretary of the Summer School, Mr. J. S. Rathbone, The Institute, Hampstead Garden Suburb, London, N.W.

A course of lectures and practical instruction on physical anthropology will be given in the anatomy departments of University College and King's College, London, by Prof. D. Waterston and Dr. D. E. Derry. The course will begin on Tuesday, January 14, at University College, and will comprise the following branches of the subject:—Cranioscopy; craniometry; osteometry; anthropometry (on the living subject); estimate of stature, age, and sex from bones; comparison with higher mammals, especially anthropoidea; and race distribution and characteristics. Further particulars may be had on application to the secretary of King's College, or to the secretary of University College.

The Eugenics Education Society has arranged for three courses of lectures upon the groundwork of eugenics, to be given at the Imperial College of Science, South Kensington, from January to December, 1913. In the spring term (January to March) there will be a course of twelve lectures on elementary biology, with special reference to the reproductive system, by Mr. Clifford Dobell; in the summer term (April to July), a course of twelve lectures on heredity, including evolution, genetics, and heredity in man, by Prof. R. C. Punnett, F.R.S.; and in the autumn term (October to December), a course of twelve lectures on statistical methods applied to some problems in eugenics, by Mr. G. Udny Yule.

In connection with the Francis Galton Laboratory for National Eugenics, a course of six lectures will be delivered at University College, London, by Prof. Karl Pearson, F.R.S. (Galton professor of eugenics), Miss Ethel M. Elderton, Dr. David Heron, and Mr. W. Palin Elderton. These lectures will be given on Tuesday evenings at 8 p.m., beginning February 11, 1913, and will deal with the following subjects:—Heredity, environment and parental habits in their relation to infant welfare; heredity of piebaldism and of albinism in man; the relation of fertility in man to social value in the parent; some points with regard to our present knowledge of heredity in cases of feeble-mindedness; the mortality of the phthisical under sanatorium and tuberculin treatments; and recent studies of heredity in dogs, and their bearing on heredity in man. The course will be open to the public without fee, but applications for tickets should be addressed to the secretary of University College.

The scheme for the rebuilding of College Hall—a hall of residence for women students of London University—has already been referred to in these columns. At a combined meeting of the trust fund committee and the executive committee of the site and rebuilding funds held last week, the chairman of the executive committee, Dr. Gregory Foster, announced that the committee, on reporting the scheme to the Queen, had obtained the gratifying response "that the object was one which met with her Majesty's entire approval," and that "so soon as the necessary funds have been raised to complete the scheme the Queen will be prepared to give her favourable consideration to the question of College Hall being named after her Majesty." With regard to these funds, it was stated that of the total sum of 30,000*l.* required, more than 9500*l.* has been obtained within the first year. It was decided to make a strong appeal, both publicly and privately, for the 20,500*l.* necessary to complete the scheme.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, November 20.—Dr. Aubrey Strahan, F.R.S., president, in the chair.—H. W. **Monckton**: The Hafslo Lake and the Solvorn Valley (Norway). The district lies north of the main Sogne Fjord and west of the Lyster Fjord. A series of valleys running from the area of the Jostedal snowfield and cutting the belt of Silurian rocks which crosses the district in a north-easterly and south-westerly direction, and a second series of valleys which run parallel to the snowfield and to the Silurian belt, are described. The valley of the Vejtestrands Lake, which belongs to the first of the above series, is traced until it reaches the Hafslo Lake, which lies at a point where the valleys of the two series intersect. The present line of drainage follows a valley of the second series from the lake to the fjord, but a disused outlet from the lake to the fjord is described belonging to the first series. While the disused outlet is probably the older of the two, reasons are given for believing that both outlets were in use during the latter part of the glacial period. Some giants' kettles, which for various reasons are believed to date from a time when the glacier extended to the places where they are now found, are described, and it is suggested that they were the work of a river flowing under the ice or between the ice and the rock.—S. **Smith**: The genus Aulophyllum. Aulophyllum is a genus belonging to the Clisiophyllid group. It is found in the upper beds of the Carboniferous Limestone Series in Britain and on the Continent. It appears in the lower part of the Dibunophyllum zone (D_1), becomes common in the middle subdivision of the zone (D_2), and is plentiful in the highest limestones investigated (D_3). The