

tive of A_1 is $[(\alpha + 1)\beta(\gamma - 1)\delta]$, and that of A_1 on the representative of A_2 is $[\alpha(\beta + 1)(\gamma - 1)\delta]$. The number of singular lines which pass through A_1 is $[\alpha\beta(\gamma + 1)\delta] - [(\alpha + 1)\beta(\gamma - 1)\delta]$, and the number of those which pass through A_2 is $[\alpha\beta(\gamma + 1)\delta] - [\alpha(\beta + 1)(\gamma - 1)\delta]$. (II.) In a system of correlations whose signature is $(\alpha\beta\gamma\delta)$, the curve of the order $[\alpha\beta\gamma(\delta + 1)]$, which represents either of two conjugate lines a_1, a_2 , breaks up into the other, together with a line through each of the singular points associated with those situated on the former. The multiplicity of a_2 on the representative of a_1 is $[\alpha(\beta + 1)\gamma(\delta - 1)]$, and that of a_1 on the representative of a_2 is $[(\alpha + 1)\beta\gamma(\delta - 1)]$. The number of singular points situated on a_1 is $[\alpha\beta\gamma(\delta + 1)] - [\alpha(\beta + 1)\gamma(\delta - 1)]$, and the number of those situated on a_2 is $[\alpha\beta\gamma(\delta + 1)] - [(\alpha + 1)\beta\gamma(\delta - 1)]$.—Mr. Spottiswoode (the chairman *pro tem.*) and Prof. Clifford spoke on the subject of Dr. Hirst's communication.—Mr. Spottiswoode, F.R.S., next briefly stated some of the results given in his paper On the contact of quadrics with other surfaces. The following were amongst those stated:—Through any m (or $m + 1$) points of space 3^{m-2} surfaces, having $2m - 2$ (or $2m - 1$) independent constants in their equation, can be drawn such that a quadric may be described touching any of the surfaces in the m (or in m out of the $m + 1$) points. Thus for example:—the equation of a quartic scroll having a triple line is $(ax + by)z^2 + (cx + dy)wy^2 - mx^2y^2 = 0$; hence, through any three points of space, three quartic scrolls having the same double line can be drawn such that a quadric may be described touching any one of the scrolls in the three points. Again, the equation of a quartic surface having for its nodal line the twisted cubic $\beta = xz - y^2 = 0$, $q = xw - yz = 0$, $r = yw - z^2 = 0$, may be put in the form $ap^2 + bq^2 + cr^2 + 2(fqr + grp + hpr) = 0$, hence, through any four points of space, three quartics, having the same twisted cubic for their common nodal line, may be drawn such that a quadric may be described touching any one of the quartics in three of the points. Remarks were made on the paper by the president and by Prof. Clifford.—A paper by Mr. J. H. Röhrs, communicated by Prof. Cayley, was taken as read. Its subject was "The Rotation of a Hollow Sphere filled with viscous fluid and made to rotate about an axis through its centre under the action of an external impressed given periodic force."

Meteorological Society, May 20.—Dr. R. J. Mann, president, in the chair.—The following papers were read:—Some remarks on the estimation of wind force, and on the relation between pressure and velocity, by C. O. F. Cator, in which he first expressed a strong opinion on the impossibility of estimating the force of the wind with any degree of accuracy; but thought that for any useful purpose it must be obtained from instrumental observation. He then referred to the different notations for describing the wind, and condemned Beaufort's (0-12) as eminently unsatisfactory, both on account of the means by which the numbers were arrived at, and also especially because of the difference of standard for the lower and higher numbers. He suggested that during an observation the wind could not practically be described as an absolute force, on account of its frequent variations, but as a varying force, extending over two or three numbers; and then proceeded to account for the difference of force, as estimated, at any stations from different directions although the velocity as shown by Robinson's cups might be the same—partly by the position of the observer not being identical with that of the cups, and partly from the surrounding objects. He then suggested a new scale, and that whether pressure or velocity were the basis, it should increase in arithmetical progression, and concluded by expressing his preference for the former.—On the weather of thirteen winters, by R. Strachan.—On a new deep-sea and recording thermometer, by H. Negretti and J. W. Zambra.—On a new mercurial minimum and maximum thermometer, by S. G. Denton.

Anthropological Institute, May 26.—Prof. Busk, F.R.S., president, in the chair.—Mr. Hyde Clarke read a paper entitled "Researches in Prehistoric and Protohistoric comparative philology, mythology, and archaeology, in connection with the origin of culture in America, and its propagation by the Sumerian or Akkad races." The author began with the illustrations of the common origin of culture in Asia, Africa, and America in a chronological series of the distribution of languages in the old and new worlds in the Prehistoric and Protohistoric epochs. These included the Negritos or Pygmies, the Cannibal races, the Carib-Whydah-Aino, the Honduras African, the Khond-Wolof, the Agaw-Guarani, the Vasco-Kolaro-Lesghian, the Ugrian, the Sumerian, &c. New facts in comparative grammar were adduced, embracing the names of animals, of weapons, the

series of negative terms, and the connection of philology, mythology, and archaeology, with a table of convertible equivalents of primary radicals. The second part of the paper was devoted to a special consideration in detail of the community of the Aymara and Quichua of Peru, the Maya of Yucatan, and the Mexican with those of Cambodia, Pegu, and Indo-China, and of these again with the newly-deciphered Sumerian or Akkad (cuneiform) and the connection with Georgian and Etruscan. These were combined with the monuments, arts, and archæology of the respective countries. The author, referring to his identification of the languages of the Brazil with the Agaw of the Nile, and the Akkads of the Caucasus, supported the view that culture had been introduced into South America across the Pacific by Easter Island, and suggested that it was from one original source in high Asia.

PARIS

Academy of Sciences, May 25.—M. Bertrand in the chair.—The Perpetual Secretary announced the death of M. Antoine-Marie-Rémy Chazallon, correspondent for the section of geography and navigation.—The following papers were read:—Note on the movement of the conical pendulum, with consideration of the resistance of the air, by M. H. Resal.—M. P. Desains presented the continuation of his paper on solar radiation. The author has employed in these experiments a modification of Nobili and Melloni's thermo-electric apparatus.—On the transformation of iron into steel, by M. Boussingault. The author's observations and analyses tend to show that melted steels of superior quality are really iron and carbon. As the quality improves sulphur diminishes, and they are generally free from phosphorus, while manganese and silicon rarely exceed 1-1000.—Observations on the spectrum of comets, by P. Secchi. The author has observed the spectrum of Winnecke's and Tempel's comet, and also of Coggia's. The results in the latter case point again to the existence of carbon in these remarkable bodies. In the same paper further evidence was adduced that the line $\lambda, 474$ does not belong to iron; and the author communicated also an observation on the effect of atmospheric oscillation on the appearance of Jupiter's first satellite just before passing on to the planet's disc.—On the Vidal ebullioscope, by M. E. Malligand and Mlle. E. Brossard-Vidal. This instrument is for the valuation of wines, and other alcoholic liquids.—On a new mineral species from the province of Lerida, by M. X. Ducloux. The analysis agrees with the formula $Sb_2O_5 + 4CuAgCO_3$.—On the conditions of the persistence of sensibility in the peripheral extremity of sectioned nerves, by MM. Arloing and L. Tripier.—On the addition of elliptic functions, by M. E. Catalin.—M. l'Abbé Aoust presented a paper in reply to the observations made by M. Serret on his paper on the integrals of curves which have an even polar surface.—M. Ch. Bontemps communicated his third note on the motion of the air in pipes.—On the action of sulphur urea and of carbon disulphide on silver urea, by M. J. Ponomareff.—Researches on germination, by MM. P. P. Dehérain and E. Landrin. Experiments on grain have shown that no gas is so hurtful to germination as carbon dioxide.—On ammonia and ammonium phenate in the treatment of cholera and diseases produced by ferments *à propos* of serpent bites, by Dr. Déclat.

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ERRATA.—Omit "59" in p. 62, col. 2, line 22 from bottom; p. 63, col. 2, line 20 from top, for "individual" read "undivided."