islands.—Rev. W. W. Spicer, on alien plants.—Rev. J. E. T. Woods, on Australian Siphonaria (describes a new species, *S. zonata*).—M. Allport, on the present stage of the salmon experiment (November 12, 1877).—Baron Ferd. von Mueller, contributions to the phytography of Tasmania, in which he adds a few more plants to his previous enumeration and effects a few changes in nomenclature; there is added a note on *Phyllota (Pultenaea) diffusa*.—Rev. J. E. T. Woods, on some new Tasmanian marine shells (describes several new species).—The meteorology of Hobart Town, January to December, 1877. In January apricots and Jargonelle pears were ripe, the general apple and pear crop in February. Leaves commenced to fall in March; the chrysanthemums were in flower in April; Lachenalia and Photinia in May; crocuses and *Pyrus japonica* in June; almonds in full bloom in July; trees breaking into leaf in August; horse chestnut in flower in September; mulberry and lime trees in leaf in October; cherries and strawberries ripe in November; currants and gooseberries in December.

Morphologisches Jahrbuch, Band 5, Heft 3.—Dr. G. Born, on the nasal cavity and tear passages in the amniotic vertebrates, pls. 23-24.—L. Graff, on *Geonemertes chalicophora*, a new land Nemertine, pl. 25-27. This new species was found in the earth of a flower-pot in the palm-house at Frankfurt. The larger specimens were 12 mm. in length and $\frac{2}{3}$ mm. in breadth; they are of a milk-white colour. A list of the land nemertines now known is appended, these being the original species of the genus described by Semper, *G. palæensis*, and *Tetrastemma agricola*, of Willemoes-Suhm.—M. v. Davidoff, on the comparative anatomy of the posterior limbs in fishes, pl. 28-31, to which is appended a note by the editor, Prof. Gegenbaur, on the limb question.—Notice of Schneider's "Comparative Anatomy."

Journal of the Russian Chemical and Physical Society.—The last number of this journal contains a paper by Prof. Butleroff, on the present meaning of the chemical theory.—The conclusion of the researches, by M. Lebavin, on the nucleine of milk.—On derivates of the fumaric and maleic acids, by M. Ossipoff.—On cholécamphoric acid, by M. Latchinoff.—On a new alkali derived from quinine, by MM. Wischnegradsky and Prof. Butleroff.—On the theory of dispersion of light, by M. Chebouëff.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, November 13.—Mr. C. W. Merrifield, F.R.S., president, in the chair.—The treasurer's and secretaries' reports were read.—The new council was elected, the only changes in which were the substitution of Messrs. Leudesdorf and Lloyd Tanner, in the place of Dr. Spottiswoode, P.R.S., and Prof. H. J. S. Smith, F.R.S., the retiring Members.—The Chairman briefly, but in feeling terms, alluded to the losses the Society had recently sustained by the deaths of such accomplished mathematicians as Prof. Clifford, Sir J. G. Shaw Lefevre, and Prof. J. Clerk Maxwell.—The following communications were made to the Society:—(1) On the binomial equation $x^p - 1 = 0$, trisection and quartisection, Prof. Cayley, F.R.S.—(2) On cubic determinants and other determinants of higher class, and on determinants of alternate numbers, Mr. R. F. Scott.—(3) On a problem of Fibonacci's, Mr. S. Roberts, F.R.S.—(4) Notes on a class of definite integrals, Mr. T. R. Terry. (1) was principally concerned with the presentation in a simplified form of results given in Reuschle's "Tafeln complexer Primzahlen welche aus Wurzeln der Einheit gebildet sind" (4to, Berlin, 1875), and in Jacobi's "Canon Arithmeticus" (4to, Berlin, 1839). (2) was on a branch of determinants which has received but little attention in this country. Mr. Lloyd Tanner communicated a paper on the subject to the Society at its June meeting in the present year. Amongst Continental papers are memoirs by Armenante, Padova, and Garbieri (in the *Giornale di Matematiche*), Dahlander and A. de Gasparis. (3) was an account and extension of work done in the Diophantine Analysis by Fibonacci, and recently by Genocchi. (4) The integrals considered were

$$\int_0^\pi \frac{\cos^p x\,dx}{(1 - 2a\cos x + x^2)^n} \quad \text{and} \quad \int_0^\pi \frac{\sin^{2p} x\,dx}{(1 - 2a\cos x + a^2)^{n+p}},$$

where p is a positive integer and n any real quantity, positive or negative, integral or fractional.

Geological Society, November 5.—Henry Clifton Sorby, F.R.S., president, in the chair.—Henry Bruce Armstrong was elected a Fellow of the Society.—The following communications were read:—On the probable temperature of the primordial ocean of our globe, by Robert Mallet, F.R.S. According to the latest hypotheses as to the quantity of water on the globe, its pressure, if evenly distributed, would be equal to a barometric pressure of 204·74 atmospheres. Accordingly water, when first it began to condense on the surface of the globe, would condense at a much higher temperature than the present boiling-point, under ordinary circumstances. The first drops of water formed on the cooling surface of the globe may not impossibly have been at the temperature of molten iron. As the water was precipitated, condensation of the remaining vapour took place at a lower temperature. The primordial atmosphere would be more oblate and less penetrable by solar heat than the present, and the difference of temperature between polar and equatorial regions would be greater; so that, in the later geologic times, ice may have formed in the one, while the other was too hot for animal or vegetable life. Thus, formerly the ocean would be a more powerful disintegrant and solvent of rocks, mineral changes would be more rapid, and meteoric agencies would produce greater effects in a given time.—On the fish-remains found in the cannel coal in the middle coal measures of the West Riding of Yorkshire, with the description of some new species, by James W. Davis, F.G.S.—On the skull of *Argillornis longipennis*, Owen, by Prof. R. Owen, C.B., F.R.S. In this paper the author described a fragmentary cranium from the London clay of Sheppey, from which it was procured by Mr. W. H. Shrubsole, who also furnished him with the humerus described in a former paper under the name of *Argillornis longipennis*.[1] In the present specimen the lower jaw and the fore-part of the upper jaw are deficient. The author described the characters presented by the specimen in detail, and stated that, like those of the humerus previously described, they seemed to approximate the fossil most nearly to the albatross among existing birds, although, like *Odontopteryx*, it differed from *Diomedea* and also from the cormorant and the totipalmates generally, in the absence of the basirostral external nares and of the supraorbital gland-pits. The present fossil differs from *Odontopteryx* in having the fore-part of the frontal broader and the upper tract of the bill less defined, as also in some other characters; but no comparison of the palatal structure can be made upon the existing specimens. In point of size, taking the albatross as a term of comparison, this skull may well have belonged to a bird with wings of the extent indicated by the humerus already described; and the resemblance of the skull to that of the albatross would also seem to be confirmatory of the specific collocation of the two specimens. The presence of four small pits or perforations on the only part of the alveolar border which appears to be uninjured, leads the author to conjecture that the bird may have been dentigerous.

Physical Society, November 8.—Prof. W. G. Adams in the chair.—The first paper read was on an analogy between the conductivity for heat and the induction balance effect of copper-tin alloys, by W. Chandler Roberts, F.R.S. Mr. Roberts traced a remarkable resemblance between a curve representing the induction balance effect of the copper-tin alloys published by him in June last, and the curve of Calvert and Johnson for the conductivity of heat, and on the other hand he showed that the induction curve does not agree with Matthiessen's curve for the electric conductivity of the same alloys. The author showed that the two alloys which occupy critical points of the curve ($SnCu_3$ and $SnCu_4$) are of much interest. Possibly both are chemical combinations, and the wide difference in the position they occupy probably marks a difference of allotropic state. For the solution of such questions, however, Mr. Roberts considered that we might look with confidence to Prof. Hughes' beautiful instrument, which, he hopes, will also help us to determine whether the relation between conductivity for heat and electricity is really as exact as it has hitherto been supposed to be. As supplementary to this subject Dr. O. J. Lodge stated that he had compared the conductivity of six bars of the tin-copper alloys, as measured by the balance and by the Wheatstone-bridge, and found them to agree very closely. The bridge results confirmed the resemblance traced by Mr. Roberts. Prof. Hughes expressed his opinion that existing tables of conductivity were erroneous. They disagreed among themselves

[1] *Quart. Journ. Geol. Soc.*, vol. xxxiv. p. 124.

and the induction-balance showed that it was difficult to get two pieces of the same metal exactly alike; hence the variation of specific conductivity results.—Prof. Ayrton stated that at a former meeting he had suggested that the electric inertia of the different specimens of metal tested might cause the difference between the results obtained by the Wheatstone Bridge and the induction-balance. Calculation had since led him to the conclusion that the inductive effect is not proportional to the resistance of the metal tested, but to an expression in which the resistance is an exponential. Prof. Hughes replied that as the inductive effect of the metal was destroyed by cutting it so as to interrupt the circuit in it, it was reasonable to suppose that the said effect was due to induced currents circulating in the metal, and therefore was proportional to the conductivity of the metal.—Capt. Armstrong exhibited a standard Daniell cell formed of a porcelain vessel with a porous partition dividing it into two compartments. In one the zinc plate was immersed in a solution of sulphate of zinc, in the other the copper-plate in a solution of sulphate of copper. To use the cell as a standard, it was only necessary to connect the two liquids by a cotton string moistened with water. This arrangement prevented mixing of the liquids, as the string could be withdrawn after use. The resistance was high, but it was a constant standard of electromotive force.—Prof. Guthrie mentioned that Prof. Pirani, of Melbourne, in a letter to him had pointed to the fact that when a dilute acid was being electrolysed, the positive electrode, if made of iron, became incandescent below the surface of the liquid. Prof. Guthrie had found this to be true not only for iron but for other metals, and that it could hardly be due to oxidation, because it took place not only at the cathode or positive electrode, where oxygen was evolved, but also at the anode where hydrogen was evolved. The incandescence appeared to him to be due to resistance. The author exhibited certain experimental results. The positive electrode when immersed in the electrolyte was seen to get red hot and to vibrate rapidly. As the liquid heated the red glow became fainter. The negative electrode, on the other hand, emitted a bright light, accompanied by a noise. The light was tinged with the characteristic colour of the flame of the metal of which it was composed; in the case of a copper electrode, for example, it was greenish. These effects were shown by Prof. Guthrie with iron, copper, and platinum electrodes, in dilute sulphuric and dilute nitric acid. In reply to Prof. Adams, Prof. Guthrie said he had not yet examined the flame by the spectroscope; and in reply to Prof. Foster he stated that the battery power used was fifty Grove's cells. He asked for suggestions as to the cause of the phenomenon.

PARIS

Academy of Sciences, November 10.—M. Daubrée in the chair.—M. de Lesseps stated that a corps for boring operations had been sent out to Panama, and he was going out in a month with a commission of selected engineers of various countries. He applied for a committee to formulate a programme of observations that might be useful to science.—Climatological conditions of the years 1869 to 1879 in Normandy, and their influence on ripening of the crops (first note), by M. Mangon. The observations were made at Saint-Marie-du-Mont (Manche), a few kilometres from the sea. The exceptional character of 1879 in temperature and rainfall is shown by numerical data (the relation to the crops being reserved for another paper).—On a new species of the genus *Anomalurus*, by M. Milne Edwards. The animal was in a collection formed at the Gaboon, by M. Leglaize. It is remarkable for its beauty of colours, and the author calls it *A. erythronotus*. It is like *A. fraseri* in general proportions, but is easily distinguished. The discovery raises to six the number of representatives of *Anomalurus*; all belong to the west of tropical Africa.—On the presence, in surface layers of the ground, of fecundated winter-eggs of phylloxera, by M. Boiteau.—On the results of treatment of phylloxerised vines with sulpho-carbonate of potash, and on the mode of use of this agent, by M. Mouillefert.—The satellites of Mars in 1879, by Mr. Hall.—Determination of the figure of apparent repose of an inextensible cord in motion in space; conditions necessary for its production, by M. Léauté.—On the thermal absorbent and emissive power of flames, and on the temperature of the voltaic arc, by M. Rossetti. For 0·01 m. of any flame traversed by radiation from a flame of the same nature, the coefficients of transparence and of absorption are represented, respectively, by 0·865 and 0·135 m. A thickness of 1 m. renders a flame almost completely athermanous for rays from another like flame. The absolute thermal emissive power of white gas flames (or the intensity of radiation of such flames of indefinite thickness, compared with that of soot at a temperature equal to the mean temperature of the flame), is equal to unity; that of a Bunsen flame 0·3219. A large number of experiments gives about 3900° C. as the maximum temperature of the positive polar carbon extremity, and 3150° for the negative; for the voltaic arc, between these, a temperature of about 4800° (with any intensity of current or thickness of arc).—Researches on the passivity of iron, by M. Varenne. Fuming nitric acid does not act on iron and render it *passive*, so that it is not attacked by dilute nitric acid. The author describes various experiments throwing light on the case. It appears that any agitation in the neighbourhood of the passive metal, whether by a shock or a vibration, or by a current of gas (very weak it may be) as from spongy platinum placed at the bottom of the vessel of dilute acid, in which the passive iron is hung, abolishes the passivity. The gaseous sheath formed on the iron seems to be the obstacle to attack. It is more adherent on a smooth surface, and on a specimen of great molecular condensation than on one rugous and less compact. *In vacuo* the sheath, and with it the passivity, disappear.—On alcoholic fermentation, by M. Cochin. He concludes from experiment that yeast does not produce a soluble alcoholic ferment.—Complementary note on calcination of the *vinasses* (or spent-wash) of beetroot, by M. C. Vincent. A reply to MM. Duvillier and Buisine.—On the organisation and the cellular form in certain kinds of mosses (*Dicranum* and *Dicranella*), by M. Heckel.—On the resistance of sheep of Barbarine race to inoculation with *charbon*, by M. Ollive. He affirms the generality of this character. During the eight years he has lived in Mogador he has never met with any case of the disease.—On the rhythmic excitability of the muscles and their comparison with the heart, by M. Richet. For the heart, as for the muscle of a claw of the cray-fish, contraction (systole) exhausts the muscular element, which then ceases to contract; but it is restored very quickly, and it is during the period of exhaustion (diastole) that the reparation takes place. The cause of rhythm is the same in both heart and muscle—rapid exhaustion and rapid reparation.—Comparison of the action of various curares on the smooth and striated muscles, by M. De Lacerda. They differ in intensity of action on these muscles, not in the nature of the action.—On medullary osseous abscesses, by Dr. Chassargnac.—M. Larrey presented Dr. Bateman's work on Darwinism demonstrated by language, and gave an *aperçu* of it.—M. Chasles presented (from Prince Boncompagni) a photolithographed copy of a long letter from Gauss to Mdlle. Sophie Germain, a student of the École Polytechnique.

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