Nelson, Christchurch, and Dunedin, each being supplied with a set of standard instruments. The service appears to have been placed, in the first instance, under the supervision of Dr. Knight, the Auditor-General, but in 1867 it was transferred to Dr. (now Sir James) Hector, under whose skilful management great improvements were introduced. The principal stations are supplied with mercurial Fortin barometers, dry and wet bulb and self-registering maximum and minimum thermometers, solar and terrestrial radiation thermometers, Robinson's anemometers, and rain gauges. The height of every barometer above sea-level has been ascertained, and every reading, as in the other colonies, is reduced to sea-level and 32° F.

At present there are eight stations, viz. Te Aroha, Taranaki, Russell, The Bluff, Wellington, Lincoln, Hokitiki and Dunedin, equipped as above, except Te Aroha, which has an aneroid; and seventy-nine rain stations.

To facilitate the transmission of daily weather reports, Sir James Hector has prepared a series of isobaric maps, which fairly represents all the different types of weather. These maps are numbered in consecutive order, and stereotyped copies are supplied to each station, so that all that is necessary is for the head office to telegraph to each office the number of the map to be posted up for the information of the public. In the same manner typical maps of the pressure in Australia have been prepared, with the assistance of Mr. Russell, of Sydney. The reports from a few selected stations, a brief description of the weather, and the number of the map, are daily exchanged between Wellington and Sydney (representing Australia); the New Zealand reports being transmitted by telegraph to the head office in each of the other colonies.

Spread throughout the colonies we have 357 meteorological stations, more or less completely equipped, and 2575 rain gauges.

It will be seen that, excepting the magnetic and meteorological observatory at Hobart, established in 1841, which was an Imperial institution, systematic observations under the auspices of the Colonial Governments date, speaking approximately, from about 1858, a date which closely coincides with that given by Prof. Waldo (1860) as marking a definite epoch in the development of the modern science of meteorology. The investigation of the law of storms by Buys Ballot, Dove, and others, and the researches of Ferrel, then just commenced, on the theory of atmospheric motions, cleared the way to further advances; and, later on, the utilisation of the electric telegraph, which is to the meteorologist what the telescope is to the astronomer, in extending his field of view over large areas of the earth's surface, enabled the observer to mark and watch the birthplace of storms, track their course and rate of translation. The same means informed him of the general distribution of pressure, and, knowing the laws governing the circulation of air currents round regions of high and low barometers, he soon felt himself justified in issuing warnings of coming gales and the probable state of the weather some hours in advance. He was no longer confined to his own particular locality, laboriously compiling statistics and studying local prognostics; he could look far around him, see storms a thousand or more miles distant, and tell people with a considerable amount of confidence when they might be expected and what would be their force. This is the great function of modern meteorology. But, like everything else, it took time. It required money from the State, which was not always readily forthcoming; it required, moreover, a complete and extensive organisation of skilled observers, all working on the same lines and with the same objects in view. It had also to win the confidence of a sceptical public, which still placed confidence in quack weather prophets, who could tell them what the weather would be all the year through, according to the phases of the moon. Confidence, we are told, is a plant of slow growth. So it is, and so it should be if progress is to be made on a sound, solid, lasting basis.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The University Lecturer in Geography (Mr. Yule Oldham) will during the present term give a course of lectures on the History of Geographical Discovery, in the Lecture-theatre of the Chemical Laboratory on Thursdays at noon, beginning on Thursday, January 24.

The Council of the Royal Geographical Society offer in the present academical year a Studentship of £100, to be used in the geographical investigation (physical or historical) of some district approved by the Council. Candidates must be members of the University of not more than eight years' standing from matriculation, who have attended the courses of lectures given in Cambridge by the University Lecturer in Geography. Applications should be addressed to the Vice-Chancellor not later than the last day of the full Lent term, March 15, 1895.

Prof. Ewing, F.R.S., has been appointed Chairman of the Examiners for the Mechanical Sciences Tripos.

The Gamble Prize for 1894 has been awarded to Miss Isabel Maddison, for her essay on "Singular solutions of differential equations of the first order."

THE first annual meeting of the Association of Technical Institutions was held on Friday last. In the course of an address, Mr. W. Mather, M.P., the President for the ensuing year, remarked that, so far as the pecuniary facilities conferred by the Technical Instruction Acts were concerned, local authorities had the means of annually bestowing on technical education in England and Wales (1) from grants under the Local Taxation Act, about £780,000; (2) from a penny rate levied on the total rateable value of the whole country, £664,500; (3) grants from the Department of Science and Art, about £355,000. The total amount available is thus, in round numbers, £1,800,000 per annum. To this must be added the voluntary aid given to technical schools and institutions. Among the resolutions adopted by the meeting was one for the appointment of a sub-committee to consider the best methods by which reform could be effected in the present system of examination in practical chemistry adopted by the Department of Science and Art, and to confer with other committees appointed with a similar object; and another to the effect that the result of examinations should not form the sole basis for the calculation of the grant in aid of science classes, but that there should also be a variable grant dependent on the report of the inspector on the equipment and arrangement for efficient instruction.

SOCIETIES AND ACADEMIES.

LONDON.

Mathematical Society, January 10.—Major Macmahon, R.A., F.R.S., President, in the chair. The Chairman gave a short obituary sketch of Mr. A. Cowper Ranyard, in the course of which he pointed out that that gentleman had only been a *pro tem.* secretary with the late Mr. G. C. De Morgan.—The secretaries elected at the first meeting of the Society, January 16, 1865, were Messrs. H. Cozens Hardy and H. M. Bompas. Mr. Hardy resigned at the second meeting (February 20), and Mr. W. Jardine was elected in his room.—The following communications were made:—Note on the expansion of functions, by Mr. Edward T. Dixon. The author had long thought that so fundamental a theorem as the expansion of a function in Taylor's series ought to be demonstrable from first principles in a simple maner which should be applicable to complex as well as to real quantities. The main feature in the proof he proposed was that the series was regarded not as the expansion in terms of powers of the increment of the variable, but rather as the expansion in terms of the values of the successive differential coefficients of the function for the given initial value of the variable. If two functions were equal for a given value of the variable, they would remain equal while the variable varied in any specified manner, so long as their rates of change remained equal and finite. The two sides of the equation known as Taylor's theorem were such functions; and the author explained how the limitations to the application of Taylor's theorem followed directly from his way of regarding the expansion. He also showed how the same line of argument applied to the case of complex variables, and how in that case also the limitations could easily be deduced.—Electrical distribution on two intersecting spheres, by Mr. H. M. Macdonald. In Maxwell's "Electricity and Magnetism," vol. i. §§ 165, 166, the problem of the distribution of electricity induced by an electrified point placed between them on two planes cutting at an angle which is a submultiple of two right angles, and the inverse problem of the conductor formed by two spherical surfaces cutting at such an angle (the angle referring to the dielectric) is solved by the method of point images. This method is inapplicable when the (dielectric) angle is not a submultiple of two right angles, as has been shown by W. D. Niven, *L.M.S.* vol. xii. p. 27. The only other case which has been hitherto solved is, the author thinks, that of the spherical bowl (Lord Kelvin, "Papers on Electrostatics and Magnetism," p. 178). In the paper by W. D. Niven, mentioned above, an attempt is made to deduce the capacity of such a conductor from the solution of a functional equation for a particular value of one of the variables, but the result obtained does not seem in the case of the spherical bowl to agree with Lord Kelvin's. The results obtained by the author also differ from those given by Niven. The object of the paper is to obtain the solution in the general case. To effect this, the functional image of a point placed between two planes intersecting at any angle is obtained in the form of a definite integral. In the next few paragraphs the reduction of this integral to known forms is effected in certain cases, and it is shown that the integration can be performed when the angle of intersection is any submultiple of four right angles; the case in which it is reducible to elliptic functions is also discussed. In § 5, the functional image of a line of uniform density parallel to the intersection of the planes is deduced. In § 7, the potential due to a freely-charged conductor bounded by two spherical surfaces cutting at any angle is obtained and some particular cases discussed. The capacity of such a conductor is obtained in § 8, in finite terms, and some particular cases are discussed in § 9; one of the most interesting of these is the capacity of a hemisphere, which is found to be nearly one and a quarter times that of the complete sphere, showing that the sharp edge acts somewhat like a condenser. Some cases are mentioned in the last paragraph which could be deduced from the results of the preceding ones.—The Dynamics of a Top, by Prof. A. G. Greenhill, F.R.S. To construct a model of the articulated deformable hyperboloid described by M. Darboux in Note xix. to Despeyrous' "Cours de Mécanique," t. ii., which shall realise the motion of the axis of a Top, the ratio of the axes of the focal ellipse must be taken equal to the modulus k of the associated elliptic functions. The parameters a and b of the two elliptic integrals of the third kind corresponding respectively to the lowest and highest vertical positions of the Top, which give the azimuth ψ, will be of the form

$$a = p\mathrm{K}'i \text{ and } b = q\mathrm{K}'i + \mathrm{K},$$

where p and q are real proper fractions. Then two points P and Q must be taken on the focal ellipse whose excentric angles, measured from the minor axis, are given by

$$\mathrm{am}\{(1 - p + q)\mathrm{K}', k'\} \text{ and } \mathrm{am}\{(1 - p - q)\mathrm{K}', k'\};$$

and if the tangents HI and HJ are drawn at Q and P, intersecting in H, these tangents make angles

$$\mathrm{am}\{(p + q)\mathrm{K}', k'\} \text{ and } \mathrm{am}\{(p - q)\mathrm{K}', k'\}$$

with the minor axis. The parallel tangents OC and OG being drawn, intersecting in O, the design of the model is completed, in Henrici's manner, by drawing any other two pairs of tangents to the focal ellipse; the tangents OG and OC being replaced by a pair of rods, representing the generators through O, HI and HJ representing the parallel generators through H, the other pairs of tangents representing the connecting generators, all freely jointed at the points of crossing. If OG is held fixed in a vertical position, the point H opposite to O is constrained to move in a fixed horizontal plane; and now if H is moved along a herpolhode of parameter $a + b$, the generator OC will imitate the motion of the axis of a Top. Starting with the hyperboloid flattened in the plane of its focal ellipse, and H at a maximum distance from OG, the axis OC is in its lowest position; and as H moves along the herpolhode to its minimum distance from OG, the axis rises to its highest position, when the hyperboloid becomes flattened in the plane of its focal hyperbola. If the herpolhode has points of inflexion, the path of a point C in the axis OC will be looped; since the motion in azimuth of OC vanishes as H passes through a point of inflexion. If $p - q = 1$, the point Q lies at the end of the minor axis of the focal ellipse; the path of C now has cusps. In the spherical pendulum the points H and O lie on the pedal of the focal ellipse with respect to the centre; this gives a geometrical interpretation of the equation

$$\mathrm{p}'a = \pm \mathrm{p}'b_1$$

discussed in Halphen's "Fonctions elliptiques," i. p. 110. The vector OH represents the resultant angular momentum of the Top; and the tangent to the path of H is thus perpendicular to the vertical plane GOC. When the momental ellipsoid at O of the Top is a sphere, then OH represents also the resultant angular velocity. But in the general case, when the momental ellipsoid at O is a spheroid, with axis OC, the resultant angular velocity is represented by the vector OI to a point I fixed in the generator HQ; also H and I describe equal curves with respect to OC in parallel planes perpendicular to OC, which are herpolhodes of parameter $a - b$. Since I can be joined to a fixed point in the opposite generator OG by a rod of fixed length, we have Darboux's theorem that the motion of the Top can be realised by rolling a herpolhode of parameter $a - b$, on a fixed sphere. The connection of the motion of a Top with herpolhodes has also been discussed by Dr. Routh, *Q.J.M.* xxiii. p. 34. As an application, consider Halphen's algebraical herpolhode

$$(\xi^2 + b^2)(\eta^2 + b^2) = a^4$$

or

$$\tfrac{1}{4}r^4 \sin^2 2\theta + b^2r^2 + b^4 - a^4 = 0,$$

produced by rolling the hyperboloid of two sheets

$$\frac{x^2}{-a^2} + \frac{y^2}{-b^2} + \frac{z^2}{a^2} = 1$$

on a fixed plane at a distance b from the centre.

In the associated motion of the Top, $p + q = \frac{1}{2}$; the focal ellipse of the articulated hyperboloid is given by

$$\frac{x^2}{0} + \frac{y^2}{\frac{1}{4}b^2\left(\frac{a^2}{b^2} - 1\right)^2} + \frac{z^2}{\frac{1}{4}b^2\left(\frac{a^2}{b^2} + 1\right)^2} = 1;$$

the coordinates of H and O in its plane are given by

$$y^2 = \frac{a^2}{8}\left(\frac{a^2}{b^2} - 1\right), \quad z^2 = \frac{a^2}{8}\left(\frac{a^2}{b^2} + 1\right);$$

at P $y^2 = \dfrac{b^4}{8a^2}\left(\dfrac{a^2}{b^2} - 1\right)^3, \quad z^2 = \dfrac{b^4}{8a^2}\left(\dfrac{a^2}{b^2} + 1\right)^3$; at Q

$$y^2 = \frac{b^8}{8a^6}\left(\frac{a^2}{b^2} - 1\right)^3\left(\frac{a^2}{b^2} + 2\right)^2, \quad z^2 = \frac{b^8}{8a^6}\left(\frac{a^2}{b^2} + 1\right)^3\left(\frac{a^2}{b^2} - 2\right)^2.$$

The motion of the axis of the Top is given by

$$\sin^2\theta \cos 2\psi = 4\sqrt{2}\,\frac{ab^2}{(a^4 + 8b^4)^{\frac{1}{4}}}\sqrt{\left\{\frac{a^4 + 2b^4}{a^2\sqrt{(a^4 + 8b^4)}} - \cos\theta\right\}}.$$

$$\sin^2\theta \sin 2\psi = \left\{\frac{a^2}{\sqrt{(a^4 + 8b^4)}} - \cos\theta\right\}$$
$$\sqrt{\left\{\frac{a^2 + 4b^2}{\sqrt{(a^4 + 8b^4)}} + \cos\theta \,.\, \frac{a^2 + 4b^2}{\sqrt{(a^4 + 8b^4)}} + \cos\theta\right\}}.$$

Thus for instance, if $a^2 = 2b^2$, $k = \frac{1}{3}$; the point Q is at an end of the minor axis of the focal ellipse, and the curve described by C has cusps. If $a^2 = 3b^2$, $k = \frac{1}{2}$; Halphen's herpolhode has points of inflexion where $r^2 = \frac{16}{3}b^2$, and r^2 varies between $4b^2$ and $8b^2$; the equation of the focal ellipse is

$$\frac{x^2}{0} + \frac{y^2}{b^2} + \frac{z^2}{4b^2} = 1,$$

and the coordinates of H and O are $\pm\frac{1}{2}\sqrt{3}\,b$, $\pm\frac{1}{2}\sqrt{6}\,b$.—Some properties of generalised Brocard circles, by Mr. J. Griffiths.—On fundamental systems for algebraic functions, by Mr. H. F. Baker.

Physical Society, January 11.—Extra meeting, in the physical laboratories of University College (by invitation of Prof. Carey Foster).—Prof. Rücker, President, in the chair.—Prof. Ramsay read a paper, by himself and Miss Dorothy Marshall, on the measurement of latent heats of vaporisation of various organic liquids. The liquid to be examined is placed in a small flask with a narrow neck, and within this is a platinum wire which has its two ends fused through the bottom, so as to be capable of conveying an electric current. The flask is completely enclosed in a jacket, which is filled with the vapour of liquid of the same kind. Before the current is turned on, the vapour jacket is kept going for some time, so that the liquid in the flask is raised just to its boiling point, but no appreciable evaporation takes place. As soon as the current is turned on, boiling commences, and all the heat developed in the wire is expended in producing evaporation. By weighing the flask before and after, the mass of liquid vaporised is determined. So far the authors have only used the method for comparative determinations. Two arrangements of the kind described are placed side by side, and the same current is sent through their two wires, which are joined in series and have approximately equal resistances. The ratio of amounts of heat expended on the two liquids divided by the ratio of the masses vaporised, is equal to the ratio of their latent heats. The determinations made by this method agree well with those of other observers; but the authors' object is to obtain values correct within about per cent. for a large number of liquids, rather than a highly accurate value for any one substance. In reply to Mr. Griffiths, the authors stated that the platinum wire was found to rise about 20° above the temperature of the liquid, and Mr. Griffiths said that his experience had been similar. He did not see why a very high degree of accuracy should not be obtainable by the method. Prof. Rücker expressed his admiration for the work, and thought it justified by the fact that the results accorded more nearly with theory than those of other observers.—Mr. Eumorfopoulos read a paper on the determination of thermal conductivity and emissivity. In the first series of experiments described, two bars of the same material and polish, and each of uniform circular section, are heated, each at one end, until the distribution of temperature has become steady. By means of two thermo-joints (one on each rod) a series of isothermal points are then found. According to the ordinary theory, if the two bars agree in temperature at a given pair of points, they will also agree in temperature at distances x_1 and x_2 measured respectively from these points, where x_1 and x_2 are connected by the relation $x_1/x_2 = \sqrt{(r_1/r_2)}$, r_1 and r_2 being the radii of the rods. This relation was not found to hold good for the rods examined. In all cases x_1/x_2 was further removed from unity than the ordinary theory would require. One conclusion was that the formula usually adopted in such cases could not be used for the comparison of conductivities, unless the radii of the rods compared are equal, and their surfaces in the same condition. To settle the question, three brass rods were chosen, and their absolute conductivities compared by Ångström's method. The emissivity was found to vary considerably with the radius, being greater the thinner the rod; moreover, the value of the emissivity deduced from the first sine term of the Fourier's series was in each case found to be about 1·2 times as great as that deduced from the constant term.—Mr. A. W. Porter then read a paper on the influence of the dimensions of a body on the thermal emission from its surface. The ordinary assumption is that whether a body is *in vacuo* or surrounded by air, the "emissivity" (*i.e.* the amount of heat passing outwards from unit area per second per degree excess of temperature) is independent of the size of the body. Results obtained experimentally by Péclet for cylinders and spheres of different sizes, show that the emissivity depends materially upon the size of the body. Péclet's formulæ for cylinders and spheres surrounded by air show that for each of these forms the rate of emission per unit surface, exclusive of the radiation effect, may be represented by a constant *plus* a term inversely proportional to the radius. The author examines the results of supposing the loss to follow only in part the law of radiation, the remainder being assumed to follow the law of conduction. He thus arrives at a formula

$$e = h + \frac{c}{a\,(\log \mathrm{R} - \log a)};$$

where e is the emissivity, a the radius of the rod, R the radius of a hollow cylinder which surrounds the bar, and above which the excesses of temperature are reckoned; while h and c are constants. This formula has been compared with experimental results of Ayrton and Kilgour, of MacFarlane, of Bottomley, and of Péclet, and has also been directly checked by experiments on a brass rod when surrounded by water-jackets of different radii, as well as on the same bar unjacketed. The author finds the agreement to be much closer than is the case on the theory of constant emissivity, or with empirically deduced formula of Ayrton and Kilgour, and he concludes that the enclosing boundary is as important a factor in determining emissivity as the size of the body itself. Prof. Carey Foster thought that in demonstrating the influence of the enclosure Mr. Porter had established an important point. Prof. Ayrton agreed as to the importance of the influence of the enclosure. He urged that in such experiments as those of Mr. Porter and Mr. Eumorfopoulos, the conductivity and emissivity, which were functions of the temperature, should not be assumed constant along the bar. Mr. Trotter objected to the use of the term emissivity as including loss of heat by contact with the air in addition to the loss by radiation. Mr. Griffiths said that in some of his experiments, where a wire conveying an electric current was immersed in a liquid in order to heat the latter, the rise of the temperature of the wire above that of the liquid was found to be nearly independent of the diameter of the wire. Mr. Eumorfopoulos said that in each case his comparison had been between portions of bars in which the range of temperature was the same. Moreover, the variation of emissivity and conductivity with temperature, as found by other observers, would be quite insufficient to account for his results. Mr. Porter said that the term emissivity had come to be accepted as referring to all heat lost at the surface of a body, whether by radiation or by conduction and convection. In that sense he had used the term. Prof. Rücker thought that emissivity, in this sense, was not a good term, but to change now would probably only make greater confusion.—Mr. G. U. Yule then gave a brief outline of his paper, on the passage of an oscillator wave-train through a plate of conducting dielectric. By a conducting dielectric the author means a substance whose conductivity and dielectric capacity are both of importance in the case under discussion; and the paper is mainly an investigation of the following problem: a train of plane electromagnetic waves falls at normal incidence on an infinite parallel sided plate of conducting dielectric, whose thickness is finite, and at the first face of the plate, the amplitude of the vibration vector in the incident train is zero up to a certain instant, and then becomes equal to an harmonic function of the time, multiplied by an exponential function with negative index: to find what proportion of the energy of the whole incident train is reflected back, what proportion is transmitted through the plate, and what proportion absorbed. At successive incidences of reflected and re-reflected wave-trains upon the two bounding faces of the plate, the amplitudes and phase-changes of reflected and transmitted portions have to be taken into account, and the resulting infinite series of terms have to be summed. The analysis is very long, but the results obtained are exact. Curves are given, showing (for special numerical values of the constants of the problem) the quasi-periodic variation of the amounts of energy transmitted and reflected, as the thickness of the plate is increased from zero up to a high value. Other curves are given showing the effect of varying the dielectric constant and the conductivity of the plate, and the difference between a "damped" and an "undamped" wave-train in regard to intensity of reflected and transmitted portions. The author compares his calculated results with measurements obtained in the case of oscillator waves travelling along a double-wire circuit about 100 metres in length; the wires at the middle of the circuit being run through a jar containing distilled water, alcohol, or a very dilute electrolyte.—The necessary corrections, however, are difficult and uncertain, and the author has not found it possible to deal with them in a satisfactory way.—A letter from Dr. E. H. Barton was read, emphasising the necessity for taking into account the damping in the oscillator-train, and at the same time pointing out why, in his opinion, the corrections applied by Mr. Yule were inadequate and failed to yield intelligible results. Prof. Rücker congratulated Mr. Yule on his work, and on the importance of the results he had obtained. In returning the thanks of the Society to Prof. Carey Foster for the invitation to meet in University College, he expressed the pleasure he had felt in observing the extent and completeness of the laboratories. Hitherto London had been behind the provinces in this matter, and it was gratifying to find that students in London had now such opportunities for practical instruction in physics. The papers which had been read at that meeting were a proof that good use was being made of the laboratories for the purposes of research. The educational experiments they had seen in the laboratories were excellently devised, and he hoped that many of them would become a part of the regular course of instruction in the country. Prof. Foster briefly replied.

Chemical Society, Dec. 20, 1894.—Dr. H. E. Armstrong, President, in the chair.—The following papers were read:—An improved form of barometer, by J. N. Collie. The author has devised a portable barometer presenting several new features.—The constituents of *Piper ovatum*, by W. R. Dunstan and H. Garnett. *Piper ovatum* is a West Indian medicinal plant; the authors have separated from it a toxic alkaloidal substance, which they term piperovatine, $C_{16}H_{21}NO_2$; it seems likely to be of service in therapeutics.—Note on the active constituent of the Pellitory of medicine, by W. R. Dunstan and H. Garnett. The Pellitory of medicine (*Anacyclus pyrethrum*) contains an active substance, which they name pellitorine; it closely resembles piperovatine, and is possibly identical with it.—The determination of some high temperature freezing-points by means of platinum-resistance pyrometers, by C. T. Heycock and F. H. Neville. The authors give the results of freezing-point determinations of a number of metals and salts.—The preparation of adipic acid and some of its derivatives, by W. H. Ince. Contrary to the statements of Arppe and Malaguti, adipic acid is not produced in the action of nitric acid on sebacic acid or beef suet. The author has prepared α-monobromadipic acid in a state of purity, and has obtained α-hydroxyadipic acid.—The action of hydrogen chloride on the oxides of calcium, barium, and magnesium, by V. H. Veley. Dry hydrogen chloride does not act on quick-lime or magnesia at ordinary temperatures; at higher temperatures action occurs. Baryta is acted on at all temperatures by the dry gas.—Latent heat of fusion, by H. Crompton.—Metallic tartrasenites, by G. G. Henderson and A. R. Ewing. Arsenious oxide dissolves in hot solutions of acid tartrates, giving tartrasenites; the sodium salt, $C_4H_4O_6AsONa, 2\frac{1}{2}H_2O$, is stable and crystalline.—Note on the interaction of hydrogen sulphide and bismuth haloid compounds, by M. M. P. Muir and E. M. Eagles.

Zoological Society, January 15.—Dr. St. George Mivart, F.R.S., Vice-President, in the chair.—Mr. P. Chalmers Mitchell exhibited and gave an account of a tibia and other bones of an extinct bird of the genus *Æpyornis* from Central Madagascar, which had been lent to him for exhibition by Mr. Joseph H. Fenn. With these bones was associated a skull of a species of *Hippopotamus*.—Prof. G. B. Howes exhibited and made remarks on the photograph of an embryo of *Ornithorhynchus*.—The Secretary exhibited, on behalf of Mr. R. Lydekker, a life-sized drawing of *Idiurus zenkeri*, a new and remarkably small form of flying squirrel from West Africa, recently described at Berlin.—Lord Lilford sent, for exhibition, the skin of a duck, believed to be a hybrid between the Mallard (*Anas boschas*) and the Teal (*Querquedula crecca*), that had been caught in a decoy in Northamptonshire.—The Rev. T. R. R. Stebbing exhibited a specimen of a species of *Peripatus* from Antigua.—Mr. Frederick Chapman gave an account of some Foraminifera obtained by the Royal Indian Marine Survey's s.s. *Investigator* from the Arabian Sea near the Laccadive Islands. The author described the forms found in the samples sent him. As many as 277 species and varieties were enumerated, some of which were new to science. Several of the species, which were here recorded for the first time from recent soundings, had been previously known from the Pliocene deposits of Kar Nicobar. One of the forms found in these recent deposits, viz., *Amphistegina radiata* (F. and M.), was described by the author as showing the presence of interseptal canals, a structure which had hitherto appeared to be restricted to Nummulites and allied forms. Examples of embryonic forms of the same species were also noted as being present in the peripheral chambers of the adult shell.—A communication was read from Mr. P. R. Uhler containing an enumeration of the Hemiptera-Homoptera of the Island of St. Vincent, West Indies. This paper had been based on specimens submitted to Mr. Uhler by the joint Committee of the Royal Society and British Association for the exploration of the Lesser Antilles.—A communication from Mr. T. D. A. Cockerell contained a description of a new species of the family *Coccidæ* belonging to *Lichtensia*, a genus new to the fauna of the Nearctic region. The species was named *L. lycii*.—Mr. Sclater read some notes on the recent occurrence of the Barbary Sheep in Egypt. A flock of these sheep had visited the eastern bank of the Nile above Wady Halfa in the summer of 1890.—A second paper by Mr. Sclater contained some notes on the recent breeding of the Surinam Water-Toad (*Pipa americana*) in the Society's reptile-house.

Entomological Society, January 16.—The sixty-second annual meeting; Mr. Henry John Elwes, President, in the chair.—An abstract of the treasurer's accounts, showing a good balance in the Society's favour, having been read by Mr. W. F. H. Blandford, one of the auditors, the secretary, Mr. H. Goss, read the report of the Council. It was then announced that the following gentlemen had been elected as officers and Council for 1895:—President, Prof. Raphael Meldola, F.R.S.; treasurer, Mr. Robert McLachlan, F.R.S.; secretaries, Mr. Herbert Goss and the Rev. Canon Fowler; librarian, Mr. George C. Champion; and as other members of the Council, Mr. George T. Bethune-Baker, Mr. Walter F. H. Blandford, Dr Frederick A. Dixey, Mr. Henry J. Elwes, Mr. Charles J. Gahan, Prof. Edward B. Poulton, F.R.S., Dr. David Sharp, F.R.S., and the Right Hon. Lord Walsingham, F.R.S. It was also announced that Prof. Meldola, the new President, would appoint Lord Walsingham, Mr. Henry J. Elwes, and Prof. Edward B. Poulton, Vice-Presidents for the session 1895–96. The outgoing President then delivered an interesting address on the geographical distribution of Lepidoptera. He remarked that though a great deal had been written of late years on the geographical distribution of plants, mammals, birds, fishes, and reptiles, comparatively little had yet been done by entomologists to show how far the natural divisions of the earth's surface which have been established for other classes were applicable to insects. Perhaps the proportion of known as compared with unknown insects was still too small, and the classification of the known species still too uncertain, to allow anything like the same methods to be applied to insects that had been used for mammals by Dr. Wallace, F.R.S., for birds by Dr. Sclater, F.R.S., and Dr. Bowdler Sharpe, and for plants by Sir J. Hooker, F.R.S., Mr. Thiselton Dyer, F.R.S., and Mr. W. B. Hemsley. The President enumerated the genera of the Rhopalocera, and pointed which of them were characteristic of the various regions and sub-regions into which the world had been divided by the zoologists and botanists above mentioned. He also exhibited specimens typical of these regions and sub-regions. The President then alluded to the prosperous condition of the Society, and to the increase in its numbers and income. Reference was also made to various Fellows of the Society and other entomologists who had died during the year, special mention being made of Herr H. T. Christoph, Mr. J. Jenner-Weir, Dr. F. Buchanan White, M. Lucien F. Lethierry, Pastor Wallengren, Dr. Jacob Spånberg, Major-General Carden, Dr. Hearder, and Mr. Wellman.—A vote of thanks to the President and other officers of the Society having been passed, Mr. Elwes, Mr. McLachlan, Mr. H. Goss, and Canon Fowler replied, and the proceedings terminated.

Royal Meteorological Society, January 16.—Mr. R. Inwards, President, in the chair.—The Council, in their report, reviewed the work done by the Society during the past year, and also stated that additional accommodation had been provided to meet the growing needs of the library. Forty-five new Fellows had been elected during the year. Mr. Inwards, in his presidential address, dealt with the subject of "weather fallacies," which he treated under the head of saints'-day fallacies, sun and moon fallacies, and those concerning animals and plants. He also referred to the almanac makers, weather prophets and impostors, who have from time to time furnished the world with fit materials for its credence or its ridicule.—Mr. C. Harding read a paper on the gale of December 21–22, 1894, over the British Isles. This storm was one of exceptional severity, especially over the northern portions of England and Ireland and in the south of Scotland. It developed energy very quickly, and travelled with great rapidity. The self-recording anemometers show that the greatest violence of the wind occurred at Fleetwood, where the velocity was 107 miles in the hour between 8.30 and 9.30 a.m. on the 22nd; and for four consecutive hours the velocity exceeded 100 miles. This is the greatest force of wind ever recorded in the British Isles, and is 10 miles an hour in excess of the highest wind velocity in the great storm of November 16–20, 1893. At Holyhead the wind in squalls attained the hourly velocity of 150 miles between 10 a.m and noon on the 22nd. The strongest force was mostly from the north-westward. Much destruction was wrought both on sea and land, and there was a heavy loss of life.

PARIS.

Academy of Sciences, January 14.—On a method of verification, applicable to the calculation of series in astronomical problems, by M. Poincaré.—On autumn cultivations for green manures, by M. P. P. Dehérain. The author insists on the importance of autumn cultivations for subsequent digging in, for two main reasons: (1) nitrates are retained by the roots of growing plants, which would otherwise be lost in the drainage waters; (2) if buried at the proper time, the decomposition of the vegetable matter affords a considerable amount of useful fertilisation.—Experimental researches on the critical point of liquids holding solid substances in solution, by M. Raoul Pictet. From the results obtained, it appears that either solid bodies become gaseous and mix with other gases at temperatures below their points of fusion and under considerable partial pressures of their own vapours, or the solid bodies present are dissolved in droplets momentarily formed in many places in the mass of gas above the critical temperature of the solvent. In the latter case, a solid deposit should be formed on superheating the vapours. This point has to be investigated.—The treatment of vines, infested by phylloxera, with peat-moss impregnated with a mineral oil, by M. F. de Mély. Details are given of a process which appears to effectually clear off the pest without injuring vegetation.—On a method of drawing a right line by the aid of jointed links, by M. Raoul Bricard.—M. J. Janssen called the attention of the Academy to the contents and scope of the *Annuaire du Bureau des Longitudes.*.—A letter from the *Königliche Gesellschaft der Wissenschaften* of Göttingen was read inviting the Academy to send delegates to Innsbrück, to take part in a meeting for the consideration of the problem of investigating the variation of the intensity of gravity with the geological character of the crust of the earth.—On the application to differential equations of methods analogous to those of Galois, by M. Jules Drach.—On the determination of the equations of continuous finite groups, by M. E. Vissiot.—On the law of transmission of energy between the source and the conductor, in the case of a permanent current, by M. Vaschy.—On the production of cathode rays, by M. Joseph de Kowalski. (1) The production of the so-called cathode rays does not depend on the discharge from metallic electrodes across a rarefied gas (2) They are produced chiefly where the primary illumination attains a considerable intensity; that is, where the density of the current lines is very considerable. (3) Their direction of propagation is that of the current lines at the place where the rays are produced, from the negative to the positive poles.—On the *entraînement* of luminous waves by matter in motion, by M. G. Foussereau.—On some properties of silver sulphide, by M. A. Ditte. The double sulphides, $4Ag_2S.K_2S.2H_2O$ and $3Ag_2S.Na_2S.2H_2O$, are described, and a method for their preparation given.—On the preparation of amorphous silicon, by M. Vigouroux. The preparation is carried out by heating to about 540° a perfectly dry mixture of silica, magnesium, and magnesia. The silicon, by the usual treatment with acids, is obtained as a pulverulent, maroon-coloured substance.—On the protomorphic state: sulphides of zinc and manganese, by M. A. Villiers.—On some sensitive reactions of amido-benzoic acids, by M. Oechsner de Coninck.—On a class of nitriles, by M. Albert Colson.—On the constitution of hexamethylenetetramine, by MM. R. Cambier and A. Brochet.—On ethylenic methylal, by M. Louis Henry.—New researches on pectase and on the pectic fermentation, by MM. G. Bertrand and A. Mallèvre. Pectase exists in solution in the cellular sap of acid fruits, just as in carrot roots. There is no insoluble pectase. In acid fruits, its action is only apparent after neutralisation.—On the influence exercised by the nervous system and the internal pancreatic secretion on histolysis. Facts illustrating the mechanism of normal glycæmia and sugar diabetes. A note by M. M. Kaufmann.—The Pleistocene of the valley of Chambéry, by MM. J. Révil and J. Vivien.—Remains of striped hyænas from the quaternary of Bagnères-de-Bigorre (Hautes-Pyrénées), by M. Édouard Harlé.—On the quaternary phosphorites from the region of Uzès, by M. Charles Depéret.—An anemometer with multiple-electrical indications and automatic orientation, by M. Jules Richard.

BERLIN.

Physiological Society, December 21, 1894.—Prof. du Bois Reymond, President, in the chair.—Prof. Waldeyer gave a lengthy account of the most recent researches on the formative structures of the nervous system, laying special stress on the following statements. The entire nervous system consists of single elements which may most conveniently be called "neurons," each of which is composed of a nerve-cell and its processes. These processes are, on the one hand, protoplasmic "dendrites" which rapidly become branched, and, on the other hand "neurites" or "axons," which give off collateral branches, soon become medullated, and end in fine branchings, as also do the collaterals. Each nerve-cell has only one "axon." The dendrites convey impulses to the cell, the neurites or axons convey impulses from the cell. All nerve-fibres, both dendrites and neurites, end freely in fine branchings. Every physiological path of conduction, whether from the periphery to the central nervous system, or *vice versâ*, consists of two or more neurons, never of one. Conduction in the neurons is always longitudinal. Impulses are transmitted from one neuron to the other only by means of the free endings of the terminal branches. The lecture was illustrated by a series of schematic diagrams and some preparations.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—L'Industrie des Araneina: W. Wagner (St. Pétersbourg).—Summer Studies of Birds and Books: W. Warde Fowler (Macmillan).—Over de Bevruchting der Bloemen: J. MacLeod (Gent, Vuylsteke).—Lens-Work for Amateurs: H. Orford (Whittaker).—Steel Works Analysis: Prof. J. O. Arnold (Whittaker).—Handbook for Hertfordshire, Bedfordshire, and Huntingdonshire (Murray).—Calcareous Cements: G. R. Redgrave (Griffin).—An Elementary Text-Book of Metallurgy: Prof. A. H. Sexton (Griffin).—Electrical Engineering: W. Slingo and A. Brooker, new edition (Longmans).—A Popular Treatise on the Physiology of Plants: Dr P. Sorauer, translated by Prof. Weiss (Longmans).—Whence Comes Man, from "Nature" or from "God"?: A. J. Bell, new edition (Isbister).—Why does Man Exist?: A. J. Bell, new edition (Isbister).—A Collection of Appliances and Apparatus for the Prevention of Accidents in Factories, 2nd edition (Dulau).—Elektrophysiologie: Prof. W. Biedermann, Erste Abthg. (Jena, Fischer).—Allgemeine Physiologie: Dr. Max Verworn (Jena, Fischer).—Manuals of Elementary Science: Zoology: Prof. A. Newton, new edition (S.P.C.K.).—Manuals of Health: Air, Water, and Disinfectants: Dr. C. M. Aikman (S.P.C.K.).

PAMPHLETS.—Elementary Practical Chemistry: J. T. Hewitt and F. G. Pope (Whittaker).—Latent Heat of Steam and Absolute Zero: W. Donaldson (Waterlow).

SERIALS.—L'Anthropologie, tome v. No. 6 (Paris).—Quarterly Review, January (Murray).—Archives of Surgery, January (West).—Journal of Anatomy and Physiology, January (Griffin).—Botanische Jahrbücher, Neunzehnter Band, 4 Heft (Leipzig).—Royal Natural History. Part 15 (Warne).—Rendiconto dell'Accademia delle Scienze Fisiche e Matematische, serie 2ª, Vol. viii, Fasc. 11°, e 12° (Napoli).—Bulletins de la Société D'Anthropologie de Paris. Nos. 5–7 (Paris).—Bulletins of the Rose Polytechnic Institute. No. 1: Physical Units: Prof. T. Gray (Terre Haute, Ind.).

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