the desire of the County Councils to improve the agricultural education of their districts will be provided. I am glad to say also that the important subject of the technical education of girls as well as boys is receiving almost universal attention from County Councils. Suggestions have been made by this Association, which have in most cases received attention, to provide not only for the instruction of the boys, but also of the girls, in such subjects as cookery, laundry-work, and dairy management. In all these matters the Association has been able to give some assistance, and we believe that there remains a great deal still in which they will be able to afford the same nature and description of assistance. I need not say, ladies and gentlemen, that for a very considerable time the work which is likely to be thrown upon this Association will be work which cannot be conducted without considerable financial resources. The income of the Association is not a very large one. We have made an appeal to many of those who throughout the country have interested themselves in this work in connection with County Councils, and we have received very liberal assistance. I think, however, the time has come when we may hope that the efforts which have been made will be to a certain extent, still more than they have hitherto been, supplemented by the assistance of gentlemen connected with the great manufacturing, mining, and commercial industries of the country, who are likely, I think, to derive at least as much benefit from the operations of this Association, and from the development which it has aided in giving technical instruction throughout the country, as the agricultural industry has already received. Ladies and gentlemen, I must apologize to you for the imperfect character of these observations, which I have been obliged to condense as much as possible, as my time, and I dare say yours, is extremely limited. I only hope that any omissions which I have made will be supplied by my friends who are on each side of me.

Sir H. Roscoe, M.P., presented the report of the work of the Association during the past year. He said that there was no doubt that during the year a very great expansion of the work of the Association had been seen under both the Acts of Parliament to which reference had been made by the Chairman. The spread of technical education throughout the country had been most remarkable. From what had already been said by Lord Hartington, it would be concluded that practically the whole of England had devoted the whole of the money to technical instruction. The effects of this could scarcely be over-estimated. The only two places where the money had been devoted to the relief of the rates were, he regretted to say, London and Middlesex. But it should be borne in mind that what had been already accomplished was nothing to what remained to be done. The County Councils were as yet only breaking the ground. Their efforts were merely tentative. They had, as it were, to work out their own salvation in this matter of education, and there was certain to be at no great distance of time an Intermediate Education Act for England. Referring to the Act of 1891, he said that it was important and valuable because it enabled a County Council to go out of its own district if it thought necessary to promote technical education. Under that Act, for instance, the three Ridings of Yorkshire had been able to vote money to assist the Yorkshire College in its scheme for the improvement of agricultural education. Many of the County Councils had already appointed organizing secretaries, and it was on these that the main part of the work would fall. To them they had to look for the special organization of each particular district, and the importance of their work could scarcely be overrated. Then in the county boroughs the work was being got into shape. In Sheffield a sum of £8495 had been appropriated towards assisting institutions giving technical and secondary education. In the same way in Manchester £10,200 had been devoted to a like purpose. Agricultural education was making rapid progress, and already in Yorkshire, Durham, and Wales there was the nucleus of high class agricultural colleges. After referring to the necessity of some part of the money being devoted to the technical instruction of girls, he concluded by expressing the hope that the Association would be placed in a position by an increase of its resources to carry on actively a work that was daily becoming more important and more costly.

On the motion of Mr. H. Hobhouse, M.P., seconded by Lord Thring, the report was unanimously adopted.

Lord Hartington at this point left the chair, which was taken by Sir Bernhard Samuelson.

Lord Monteagle moved the reappointment of the vice-president, executive committee, and officers of the Association, the name of Mr. Bryce, M.P., being substituted for that of the late Earl Granville. Dr. Gladstone seconded, and Mr. Snape supported, the motion, which was carried unanimously.

Mr. Bryce, M.P., proposed the following resolution :—

"That this Association heartily congratulates the County Councils of England and Wales on the great progress they have made during the past year in the promotion of education in their districts, and earnestly trusts that they will continue to work until the country is provided with an organized system of secondary and technical education."

Miss Hadland seconded the resolution, which was agreed to.

Sir John Lubbock, M.P., proposed, and Mr. Rathbone, M.P., seconded, a vote of thanks to the Chairman, and this having been heartily accorded was acknowledged by Sir Bernhard Samuelson.

The proceedings then terminated.

SCIENTIFIC SERIALS.

IN the *Journal of Botany* for May, Prof. R. J. Harvey-Gibson has an interesting article, illustrated, on the histology of *Polysiphonia fastigiata*. In the June number, Mr. A. W. Bennett contributes a short paper on sexuality among the Conjugatæ. These numbers also contain continuations of Mr. E. G. Baker's synopsis of the genera and species of Malveæ, and of the Rev. H. G. Jameson's useful key to the genera and species of British mosses.

THE papers in the *Botanical Gazette* for April and May are concerned almost exclusively with American botany. Mr. D. M. Mottier has an interesting note on the apical growth of Hepaticæ, which bears such a striking resemblance to that of the prothallium of ferns.

THE number of the *Nuovo Giornale Botanico Italiano* for April is chiefly occupied by papers of special interest to Italian botanists, and by the Bulletin of the Italian Botanical Society. Among the articles coming under the latter head is one by Sig. Baccarini on the secretory system of the Papilionaceæ, and one by Sig. Pichi containing an account of experiments on the parasitism of *Peronospora* on the vine.

THE *Botanical Magazine* of Tokyo still contains occasional articles in the English language. Those in the numbers most recently received, for March and April, relate to the native plants of Japan.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 11.—"A Study of the Planté Lead—Sulphuric Acid—Lead Peroxide Cell, from a Chemical Standpoint. Part I." By G. H. Robertson. Communicated by Prof. Armstrong, F.R.S.

The investigation, the results of which are recorded in this paper, was instituted about a year ago at the Central Institution, at Dr. Armstrong's suggestion, as McLeod's observations on the electrolysis of sulphuric acid solutions led to the supposition that the changes occurring in the acid were probably less simple than was commonly supposed. This supposition was verified.

The first section of the paper deals with the nature of the lead salt formed during discharge. Experiments made on various samples of red lead of different percentage composition showed that, as with nitric, so with sulphuric acid, it behaved like a mixture of peroxide and monoxide, the sulphate formed always corresponding to the monoxide originally present.

As analysis alone can give no proof of the existence of a definite homogeneous sulphate corresponding to red lead; evidence must be obtained that the product differs in some of its properties from a mixture. It was to be expected that the E.M.F. of an oxysulphate would differ from a corresponding mixture of sulphate and peroxide, and have some definite value, but experiments made with mixtures of sulphate and peroxide in different proportions, and with the product obtained by treating red lead with dilute sulphuric acid, showed that there was a difference of degree only between the red lead pastes and the mixtures.

With regard to Frankland's observations respecting the

colour of the product formed on the peroxide plate during discharge, and the reducibility of the sulphate, the author points out that the colour is due to the incomplete reduction of the peroxide; and that careful examination of the plugs from a discharged cell shows that the base consists of practically unaltered peroxide of lead, and that the surface, which is rich in $PbSO_4$, is really a mass of partially reduced granules of peroxide of lead which are coated with sulphate.

Also, though pure lead sulphate is very difficult to reduce, it is well known that mixtures of lead sulphate and peroxide of lead, or other conducting substances, are reduced with comparative ease, and that it is very intimate mixtures of this nature which have to be dealt with as a rule in charging a cell.

In conclusion, the author points out—

That neither chemical nor electrical tests give any ground for supposing that any other sulphate than the ordinary white $PbSO_4$ is concerned in the interactions occurring in the cell;

That were the sudden lowering of the E.M.F. caused by a change in the nature of the chemical compounds formed on the plates, it is very difficult to account for the very rapid recovery of the E.M.F. exhibited by an apparently discharged cell.

In the second section the electrolyte is dealt with, and, after referring to the work of Berthelot, Richarz, Schöne, Traube, and others on the electrolysis of sulphuric acid solutions, the author describes experiments made to test the effect of the addition of sodium sulphate to the electrolyte, as recommended by Mr. Barbour Starkey, as it seemed probable it had a catalytic action on the "peroxides" always found in electrolyzed acid of the strength used in batteries.

Mr. Preece most kindly aided the investigation by allowing experiments to be carried out at the General Post Office, where one-half of the secondary cells contain 1 per cent. of sodium sulphate, and the other half ordinary dilute acid, sp. gr. 1180. It was found that the addition of sodium sulphate in about the proportion of 1 per cent. to freshly electrolyzed acid, or during electrolysis, always produced a diminution in the total quantity of "active oxygen," and brought the amount present in the plain cells down almost exactly to that found in the sodium sulphate cells.

Determinations were made of the amounts of "active oxygen" present as persulphuric acid and hydrogen dioxide respectively; and it was established that acid taken from the cell reduced peroxide of lead. The presence of hydrogen dioxide being thus established both directly and indirectly, its effect on the E.M.F. of a cell was tested. It was found that, while its addition to the acid in the case of a lead lead-peroxide couple in dilute sulphuric acid produced an annulment, or reversal, of the E.M.F., the introduction of hydrogen dioxide into the body of the peroxide paste produced an increase in the E.M.F. in the case of a platinum lead-peroxide couple.

The Post Office records showed that, while the general character of the temperature and specific gravity changes occurring during charge and discharge were the same in both types of cell, there was less sulphating with the sodium sulphate electrolyte.

The cause of the pink colour of the acid, noticed by Mr. Crompton and others, was investigated, and found to be permanganic acid, formed probably from the manganese present in commercial lead.

In conclusion, the author points out—

That peroxides are found in appreciable quantities in the electrolyte during charge and discharge;

That their influence must not be neglected in considering the behaviour of the Planté cell;

And that it is to the electrolyte, rather than to the plates, that attention must be directed if any considerable improvement is to be effected.

"Part II.—A Discussion of the Chemical Changes occurring in the Cell." By H. E. Armstrong, F.R.S., and G. H. Robertson.

The authors arrive in this paper at the following conclusions:—

(1) That the cooling observed in the Planté cell can only be explained as resulting from the dissociation of the dilute sulphuric acid; and as the values given by Messrs. Ayrton, Lamb, Smith, and Woods are in practical agreement with those calculated on the assumption that the acid used is sulphuric acid itself, H_2SO_4, that in all probability such acid, and not the dilute acid contained in the cell, is operative throughout.

(2) That the observed loss in efficiency cannot be due to temperature changes, as these arise through actions occurring out of circuit.

(3) That it is difficult, from a comparison of calculated with observed values of the E.M.F., to arrive at any final conclusion as to the exact nature of the changes which take place in the cell. On the assumption that sulphating occurs at both plates in circuit, and under the influence of H_2SO_4, the calculated value is considerably too high; while, if sulphating occur only at the lead plate, the value calculated is far too low.

(4) That a counter E.M.F. of about 0·5 volt would account for the observed departure from the highest calculated value. As peroxides are always present in the electrolyte, it is conceivable that such a counter E.M.F. may exist; moreover, there is also the possible influence of the lead support to be considered.

(5) That the observed loss of efficiency is to be attributed to the formation of peroxides in the electrolyte, and to the excessive sulphating occurring chiefly at the peroxide plate in the local circuit existing between the support and the paste.

June 18.—"Comparison of Simultaneous Magnetic Disturbances at several Observatories, and Determination of the Value of the Gaussian Coefficients for those Observatories." By Prof. W. Grylls Adams, D.Sc., F.R.S., Professor of Natural Philosophy in King's College, London.

After drawing attention to previous investigations on this subject, and pointing out the importance of adopting the same scale values for similar instruments at different Observatories, especially at new Observatories which have been recently established, the discussion of special magnetic disturbances is undertaken, especially the disturbances of a great magnetic storm which occurred on June 24 and 25, 1885, for which photographic records have been obtained from 17 different Observatories: 11 in Europe, 1 in Canada, 1 in India, 1 in China, 1 in Java, 1 at Mauritius, and 1 at Melbourne.

The records are discussed and compared, tables are formed of the simultaneous disturbances, and the traces are reduced to Greenwich mean time and brought together on the same plates arranged on the same time-scale. Plates I. and II. show the remarkable agreement between the disturbances at the different Observatories, and the tables show that the amount of disturbance, especially of horizontal magnetic force, is nearly the same at widely distant stations.

An attempt has also been made to apply the Gaussian analysis to sudden magnetic disturbances, and, with a view to their application in future work, the values of the Gaussian coefficients have been obtained for 20 different Observatories, and the numerical equations formed for the elements of magnetic force in three directions mutually at right angles, and also the equation for the magnetic potential in terms of the Gaussian constants to the fourth order.

The tables give the numerical values to be multiplied by the 24 Gaussian constants to give the values of the forces X, Y, and Z in the geographical meridian towards the north, perpendicular to the meridian towards the west, and towards the earth's centre respectively. The equations are also formed and the values obtained in terms of the 24 Gaussian constants for X_2, Y_2, and Z_2; X_2 being the horizontal force in the magnetic meridian, Y_2 the horizontal force perpendicular to the magnetic meridian, and Z_2 the vertical force. If then X_2, Y_2, and Z_2 be the observed values of any simultaneous disturbances, they may be at once substituted in the equations, the equations giving the 24 Gaussian constants may be solved, and the corresponding change of magnetic potential may be determined.

Physical Society, June 12, 1891.—Prof. W. E. Ayrton, F.R.S., President, in the chair.—Prof. W. G. Adams took the chair whilst Prof. Ayrton read a paper on alternate current and potential difference analogies in the methods of measuring power, by himself and Dr. Sumpner. In a paper read before the Society in March last, the authors pointed out that, for every method of measuring power in which readings of volts and amperes were taken, other methods in which amperes were read instead of volts, and volts instead of amperes, could be devised. More recently, Dr. Fleming had, by a transformation of a formula given by the authors in a communication made to the Royal Society on the measurement of power by three voltmeters, given the analogue in which three ammeters were employed. The two arrangements are represented in Figs. 1 and 2, whilst Fig. 3 shows a modification of Dr. Fleming's method (Fig. 2), in which the current in the non-inductive resistance r is

measured by the aid of a voltmeter V across its terminals. This obviates the necessity of putting an electro-magnetic instrument

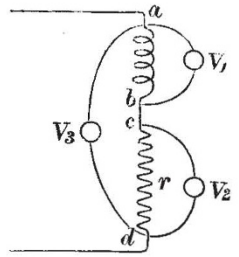

FIG. 1.

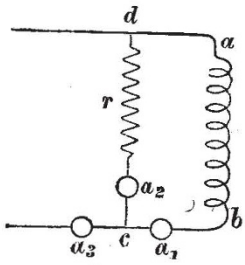

FIG. 2.

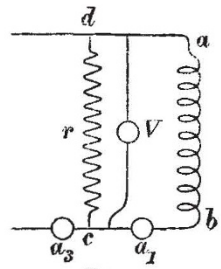

FIG. 3.

in what should be a non-inductive circuit. The formula for the mean watts spent in the circuit *ab*, Figs. 1 and 2, are respectively—

$$W = \frac{1}{2r}\left(V_3^2 - V_1^2 - V_2^2\right), \text{ and } W = \frac{r}{2}\left(A_3^2 - A_1^2 - A_2^2\right).$$

Mr. Blakesley's method of measuring power by a split-dynamometer was shown to be analogous to the original electrometer method in which the difference of two readings was proportional to the power, and Blondlot and Currie's double electrometer method was shown to be the analogue of the ordinary wattmeter. The wattmeter was defective in the fact that a solenoidal coil was inserted in a nominally non-inductive circuit. The error thus introduced is, as was shown by one of the authors some years ago, expressed by the formula—

$$\frac{\text{Apparent watts}}{\text{True watts}} = \frac{1 + \tan\theta \,.\, \tan\phi}{1 + \tan^2\phi},$$

where θ is the phase angle between the current and E.M.F. in the circuit in which the power is to be measured, and ϕ the phase angle for the approximately non-inductive circuit. It is now proved that the same formula expresses the error in any of the methods where resistances not wholly non-inductive are used. As is well known, Mr. Blakesley has applied his split-dynamometer to the measurement of phase differences between two currents; and an analogous method of finding the phase difference between two potential differences is described in the paper. In this method a high resistance split-dynamometer such as suggested by Mr. Rimington for measuring power is employed. Blondlot and Currie's double electrometer could also be used for the same purpose. Numerous diagrams illustrating the various analogies accompany the paper. Prof. S. P. Thompson inquired whether hot-wire voltmeters could be employed to measure the various potential differences, without introducing error. In reply, Prof. Ayrton said that, although no great error was introduced by the self-induction of these instruments, yet the fact that they required considerable current was a disadvantage, and as these currents were not always in the same phase as those in other circuits, troublesome corrections were sometimes necessary. Electrostatic instruments were preferable. Prof. Adams said he was glad to hear that the inductance of Cardew voltmeters introduced no serious error, for they were very convenient instruments to use.—Prof. O. Lodge, F.R.S., exhibited and described a clock for pointing out the direction of the earth's orbital motion in the ether. After mentioning the various motions to which a point on the earth's surface is subjected, he pointed out that the orbital motion was the largest component, and its direction at any instant not easy to conceive. An apparatus for pointing out this direction was therefore convenient when dealing with problems requiring a knowledge of the motion of a point through the ether. In one of two clocks shown, one spindle representing the earth's polar axis and another the axis of the ecliptic were inclined at an angle of $23\frac{1}{2}°$, and coupled by a Hooke's joint. The latter axis was capable of rotating round the former. At its upper end the ecliptic axis carried a tube and a pointer, both being perpendicular to the axis and to each other. The clock keeping solar time rotated both axes, and when properly set the tube pointed in the direction of the sun, and the pointer therefore indicated the direction of the earth's orbital motion.—Some experiments with Leyden jars were then shown by Dr. Lodge. The first one was with resonant jars, in which the discharge of one jar precipitated the overflow of another, when the lengths of the jar circuits were properly adjusted or tuned. The latter jar was entirely disconnected from the former, and was influenced merely by electro-magnetic waves emanating from the discharging circuit. Lengthening or shortening either circuit prevented the overflow. Correct tuning was, he said, of great importance in these experiments, for a dozen or more oscillations occurred before the discharge ceased. The effect could be shown over considerable distances. In connection with this subject Mr. Blakesley had called his attention to an observation made by Priestley many years ago, who noticed that, when several jars were being charged from the same prime conductor, if one of them discharged the others would sometimes also discharge, although they were not fully charged. This he (Dr. Lodge) thought might be due to the same kind of influence which he had just shown to exist. The word *resonance*, he said, was often misunderstood by supposing it always had reference to sound, and as a substitute he thought that *symphoning* or *symphonic* might be allowable. The next experiment was to show that wires might be tuned to respond to the oscillation of a jar discharge just as a string could be tuned to respond to a tuning-fork. A thin stretched wire was connected to the knob of a jar and another parallel one to its outer coating, and by varying the length of an independent discharging circuit, a glow was caused to appear along the remote halves of the stretched wires at each discharge. Each of the wires thus acted like a stopped organ-pipe, the remote ends being the nodes at which the variations of pressure were greatest. By using long wires he had observed a glow on portions of them with the intermediate parts dark; this corresponded with the first harmonic, and by measuring the distance between two nodes he had determined the wave-length of the oscillations. The length so found did not agree very closely with the calculated length, and the discrepancy he thought due to the specific inductive capacity of the glass not being the same for such rapidly alternating pressures as for steady ones. He also showed that the electric pulses passing along a wire could be caused (by tuning) to react on the jar to which it was connected, and cause it to overflow even when the distance from the outside to the inside coating was about 8 inches. During this experiment he pointed out that the noise of the spark was greatly reduced by increasing the length of the discharging circuit. The same fact was also illustrated by causing two jars to discharge into each other, spark gaps being put both between their inner and outer coatings so as to obtain "A" sparks and "B" sparks. By putting on a long "alternative path" as a shunt to the B spark gap and increasing that gap, the noise of the A spark was greatly reduced. He had reason to believe that the B spark was a quarter phase behind the A spark, but the experimental proof had not been completed. He next described some experiments on the screening of electro-magnetic radiation, in which a Hertz resonator was surrounded by different materials. He had found no trace of opacity in insulators, but the thinnest film of metal procurable completely screened the resonator. Cardboard rubbed with plumbago also acted like a nearly perfect screen. In connection with resonators, he exhibited what he called a *graduated electric eye* or an *electric harp*—made by his assistant, Mr. Robinson—in which strips of tin foil of different lengths are attached to a glass plate, and have spark gaps at each end which separate them from other pieces of foil. One or other of the strips would respond according to the frequency of the electro-magnetic radiation falling upon it. Mr. Blakesley asked whether the pitch of the resonant jars altered when the distance between their circuits was varied, for according to theory the mutual induction should diminish the self-induction, and cause the oscillations to be more rapid. If this occurred, the method might be used for getting rapid oscillations. He also inquired whether the glow would appear in the same position on the two stretched wires if their

ends were joined. Dr. Sumpner wished to know how the resistances, inductances, and capacities of the circuits and jars were determined, and whether any evidence of irregular distribution of the charges on the tin-foil had been noted. With reference to the overflowing of a jar caused by using a certain length of discharging circuit, he asked whether the overflow did not prove the existence of a higher potential than that which originally existed between the coatings of the jar, and, if so, where did the excess energy come from? Dr. Thompson asked if it would be possible to make a wire circuit analogous to an open organ-pipe by putting sheets of metal on the ends of the wires. Dr. Lodge, in reply, said Mr. Blakesley's suggestion was an important one, but he had not observed that any change in the adjustment was necessitated by varying the distance between the resonating circuits. Neither had he noticed any glow on wires joined to form a single loop, but this might be possible if the wires were long enough to give harmonics. In answer to Dr. Sumpner he said that the capacities were difficult to determine, for with such rapid oscillations the coatings were virtually enlarged. Lord Rayleigh had shown how to calculate the inductances, and the resistances he had practically measured by his alternative path experiments. The overflow of jars he thought was caused by the charges in some way concentrating on the edges of the foil, thus causing a kind of flood tide, at which the overflow occurred. The President asked Dr. Lodge what his views were as to the cause of the opacity of ebonite to light. Was it due to a selective absorption which cut off only the rays to which the eye was sensitive, or was the ordinary explanation, that it contained impurities which were conducting, and hence acted as screens, likely to be correct? Another possible explanation was that the motion of the ether particles may be in three dimensions, and light be due to the projection of this motion on a plane perpendicular to the ray, whilst electromagnetic induction might be due to the other component. Dr. Lodge said he believed that ebonite was not opaque because of conducting particles being present, and was inclined to think that it acted more like ground glass, in which the opacity was due to internal reflections. Such a substance would only be opaque to vibrations whose wave-lengths were comparable with the size of the particles.—A note on the construction of non-inductive resistances, by Prof. W. E. Ayrton, F.R.S., and Mr. T. Mather, was postponed until next meeting.

Zoological Society, June 16.—Dr. St. George Mivart, F.R.S., Vice-President, in the chair.—Mr. H. A. Bryden exhibited an abnormal pair of horns of a cow Eland obtained in the North Kalahari, and made remarks on the structure of the feet of the Lechée Antelope.—Mr. Howard Saunders exhibited and made remarks on a nearly white skin of a Tiger obtained in Northern India by Major D. Robinson.—Mr. Saunders also exhibited specimens of the eggs of a Gull (*Larus maculipennis*) and of a Tern (*Sterna trudeaui*) from Argentina.—Mr. Sclater read an extract from a letter received from Dr. Bolau, C.M.Z.S., describing two Sea-Eagles living in the Zoological Garden, Hamburg, and considered to be referable to Steller's Sea-Eagle (*Haliaëtus pelagicus*). One of these, received from Corea, Mr. Sclater pointed out, probably belonged to the species described in the Society's Proceedings by Taczanowski as *Haliaëtus branickii*.—Dr. R. Bowdler Sharpe gave a short account of the proceedings of the International Ornithological Congress recently held at Budapest, in which he had taken part.—Mr. G. A. Boulenger read a paper entitled "A Contribution to our Knowledge of the Races of *Rana esculenta* and their Geographical Distribution." Mr. Boulenger proposed to recognize four forms of this widely-spread species of Frog, and pointed out the characters upon which these races were based and the areas which they occupy.—Mr. Oldfield Thomas read some notes on various species of Ungulates, which he had made during a recent examination of the specimens of this group of Mammals in the British Museum.—Mr. Edgar A. Smith gave an account of a large collection of Marine Shells from Aden. To this were added some remarks upon the relationship of the Molluscan Fauna of the Red Sea with that of the Mediterranean.—A second communication from Mr. Smith contained descriptions of some new species of Shells, based on examples obtained during the *Challenger* Expedition.—Mr. H. A. Bryden read some notes on the present distribution of the Giraffe south of the Zambesi, and made some remarks on the best means of procuring living specimens of this animal for European collections.—A communication was read from Messrs. Mole and Urich containing notes of some of the Reptiles of Trinidad, of which they had transmitted living examples to the Society's Menagerie.—Mr. F. E. Beddard read some additional notes upon the anatomy of *Hapalemur griseus*, made during a recent examination of two specimens of this Lemur.—Mr. E. B. Poulton gave an account of an interesting example of protective mimicry discovered by Mr. W. L. Sclater in British Guiana. This was an immature form of an unknown species of Homopterous insect of the family Membracidæ, which mimics the Cooshie Ant (*Ecodoma cephalotes*).—This meeting closes the present session. The next session (1891-92) will begin in November next.

Royal Microscopical Society, June 17.—Dr. R. Braithwaite, President, in the chair.—The President said he regretted to announce the death of Prof. P. Martin Duncan, who as a past President of the Society, was well-known to the Fellows.—A negative of *Amphipleura pellucida*, produced with Zeiss's new $\frac{1}{50}$ of 1·6 N.A. and sunlight, by Mr. T. Comber, of Liverpool, was exhibited, and his letter was read suggesting that the want of sharpness was due to the employment of a projection eye-piece for a tube-length of 160 mm., whereas the objective was made for a tube-length of 180 mm. The illumination was axial with a Zeiss achromatic condenser of 1·2 N.A. Mr. Comber thought the resolution showed indications of so-called "beading," and he inferred that the ultimate resolution would be similar to that of *Amphipleura lindheimeri*. The mounting medium had a refractive index of 2·2, but was very unstable, granulations appearing in a very short time.—Mr. C. L. Curties exhibited Mr. Nelson's apparatus for obtaining monochromatic light. Mr. Mayall said the apparatus was so devised that the microscopist might employ any prism or photographic lens he possessed. If a prism was made specially, one of light crown-glass would probably answer better than the dense flint.—Mr. T. T. Johnson exhibited a new form of student's microscope which he had devised. Mr. Mayall said the special point was the application of a screw movement to raise and lower the substage, the screw being in the axis of the bearings of the substage and tailpiece; and the position of the actuating milled head, which projected slightly at the back of the stage, seemed to be most happily chosen.—Dr. J. E. Talmage, of Salt Lake City, Utah, U.S.A., a newly elected Fellow, having been introduced by the President, read a note on the occurrence of life in the Great Salt Lake, and exhibited some specimens of *Artemia fertilis* from the lake.—Prof. Bell said a paper was read at the February meeting, in which Dr. Benham described a new earthworm under the name of *Eminia equatorialis*. The name *Eminia* having been already given to a bird by Dr. Hartlaub, Dr. Benham proposed to re-name the earthworm *Eminodrilus*.—A letter from Dr. Henri Van Heurck was read, replying to the criticisms of his microscope delivered at the previous meeting. A discussion followed, in which Mr. Mayall, Dr. Dallinger, and Mr. Watson joined.—Mr. T. D. Aldous exhibited the eggs of a water-snail which were attacked by a parasite which seemed to be destroying the gelatinous matter to get at the eggs.

Royal Meteorological Society, June 17.—Mr. Baldwin Latham, President, in the chair.—Mr. A. J. Hands gave an account of a curious case of damage by lightning to a church at Needwood, Staffordshire, on April 5, 1891. The church was provided with a lightning-conductor, but Mr. Hands thinks that when the lightning struck the conductor, a spark passed from it to some metal which was close to it, and so caused damage to the building.—Mr. W. Ellis read a paper on the mean temperature of the air at the Royal Observatory, Greenwich, as deduced from the photographic records for the forty years from 1849 to 1888, and also gave some account of the way in which, at different times, Greenwich mean temperatures have been formed.—Mr. Ellis also read a paper on the comparison of thermometrical observations made in a Stevenson screen with corresponding observations made on the revolving stand at the Royal Observatory, Greenwich. From this it appears that the maximum temperature in the Stevenson screen is lower than that of the revolving stand, especially in summer, and the minimum temperature higher, whilst the readings of the dry and wet bulb thermometers on both the screen and the stand, as taken at stated hours, agree very closely together.—Mr. W. F. Stanley exhibited and described his phonometer, which is really a new form of chronograph, designed for the purpose of ascertaining the distance of a gun from observations of the flash and report of its discharge, by the difference of time that light and sound take in reaching the observer. The instrument can also be used for measuring the distance of lightning by timing the interval between the flash

and the report of the thunder.—A paper was also read by Mr. A. B. MacDowall, on some suggestions bearing on weather prediction.

Geological Society, June 24.—Sir Archibald Geikie, F.R.S., President, in the chair.—The following communications were read:—On wells in West Suffolk boulder-clay, by the Rev. Edwin Hill. It might be supposed that in a boulder-clay district water could only be obtained from above or from below the clay. But in the writer's neighbourhood the depths of the wells are extremely different, even within very short distances; and since the clay itself is impervious to water, he concludes that it must include within its mass pervious beds or seams of some different material which communicate with the surface. It would follow that this boulder-clay is not a uniform or a homogeneous mass. The visible sections are only those given, at hand by ditches, and at a considerable distance north and south by pits at Bury St. Edmunds and Sudbury. The appearances in these harmonize with that conclusion. Conclusion and appearances differ from what we should expect on the theory that this boulder-clay was the product of the attrition between an ice-sheet and its bed. The reading of this paper was followed by a discussion in which Prof. Prestwich, Dr. Evans, Mr. Clement Reid, Mr. Charlesworth, Mr. Topley, Mr. Goodchild, the President, and the author took part.—On the melaphyres of Caradoc, with notes on the associated felsites, by Frank Rutley.—Notes on the geology of the Tonga Islands, by J. J. Lister. (Communicated by J. E. Marr, F.R.S.)—On the Inverness earthquakes of November 15 to December 14, 1890, by C. Davison. (Communicated by Prof. Chas. Lapworth, F.R.S.) In this paper the author gives reasons for supposing that the Inverness earthquakes of last year were due to the subsidence of a great wedge of rock included between a main fault and a branch one; and he considers that there is little doubt that these recent earthquakes were the transitory records of changes that, by almost indefinite repetition in long past times, have resulted in the great Highland faults.—The next meeting of the Society will be held on Wednesday, November 11.

PARIS.

Academy of Sciences, June 29.—M. Duchartre in the chair.—On persulphates, by M. Berthelot. Some new facts are stated in proof of the existence of persulphuric acid not merely as an anhydride, S_2O_7, but also as a compound capable of forming distinct salts, similar as regards composition to permanganates, perchlorates, permolybdates, and pertungstates.—Experiments on the mechanical actions exercised on rocks by gas at high pressures and in rapid motion, by M. Daubrée. The author shows that volcanoes of the same group have approximately the same height, and points out that it is probable that each group is the result of internal action at one centre. These considerations are applied to old volcanic rocks, which often exhibit a marked tendency to equality of level. The experiments which throw light on the disturbances investigated were previously described.—Action of sodium alcoholates on camphor: new method of preparation of alkyl camphors, by M. A. Haller.—On a cryptogam parasite of locusts, by M. Charles Brongniart.—On surfaces possessing the symmetry of plane systems, by M. S. Mangeot.—On homogeneous finite deformations: energy of an isotropic body, by M. Marcel Brillouin.—On the biaxial character of compressed quartz, by M. F. Beaulard.—The photogenic efficiency of different sources of light, by M. A. Witz.—On an electro-magnetic bell, by MM. Guerre and Martin.—Contribution to the study of atmospheric electricity, by M. Ch. André. It is generally admitted that atmospheric electricity is subject to a diurnal variation. A discussion of the observations made by M. Mascart at Lyons since 1884 shows that electric potential varies in much the same manner as barometric pressure and relative humidity. In fact, curves showing the annual variations of relative humidity and electric potential have precisely the same form.—On the oxidation of azo-compounds, by M. Charles Lauth.—On the formation of the mesentery and the intestinal canal in the embryo of the fowl, by M. Dareste.—On the sting of *Heterodera Schachtii*, by M. Joannes Chatin.—On Cladosporiæ Entomophytæ, a new group of parasitic fungi of insects, by M. Alfred Giard.—Contribution to the study of the differentiation of the endoderm, by M. Pierre Lesage.—On the destruction of *Peronospora Schachtii* of the beetroot, by means of compounds of copper, by M. Aimé Girard.—Influence of muscular exercise on the excretion of urinary nitrogen, by M. Chibret.

BRUSSELS.

Royal Academy of Sciences, April 4.—M. F. Plateau in the chair.—On the characteristic property of the common surface of two liquids under their mutual affinity, Part iii., by M. G. Van der Mensbrugghe. The observations given in the first paper indicated that the common surface of two liquids which act upon one another is subjected to a force whose direction is away from the centre of curvature. In the present note the author gives some new facts which appear to render this *force d'extension* very manifest. When a drop of olive oil is put upon the surface of distilled water, it slowly breaks up into a lens-shaped drop on the water surface and a spherical drop which descends to the bottom of the containing vessel. It is shown that a slow diminution occurs of the tension of the surface common to the oil and water. This diminution apparently arises from a slow chemical action between the two liquids, and which, if sufficiently prolonged, is manifested by the formation of a thin pellicle separating them. Many such phenomena as these are stated and explained according to the new theory.—Fourth note on the structure of the equatorial bands of Jupiter, by M. F. Terby. The author remarks that he was the first to comment upon the structure of Jovian equatorial bands, and to make known the fact that it is observable in small instruments. In a recent publication Mr. Keeler has overlooked these observations, and rendered this rectification necessary.—On the number of invariant functions by M. Jacques Deruyts.—*A propos* the rotation of the planet Venus, by M. L. Niesten (see NATURE, June 18, p. 164).—Geometrical calculation of the distances of remarkable points of triangles, by M. Clément Thiry.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Saturn's Kingdom: C. M. Jessop (Paul).—Collection de Mémoires relatifs à la Physique, tomes i. to iv. (Paris, Gauthier-Villars).—Charles Darwin: C. F. Holder (Putnam).—Solutions of Examples in Elementary Hydrostatics: Dr. W. H. Besant (Bell).—Practical Electro-Therapeutics: A. Harries and H. N. Lawrence (Low).—Popular Astronomy: Sir G. B. Airy; new edition (Macmillan and Co.).—The *Electrician* Primers, 2 vols. (*Electrician* Office).—Report on the Cahaba Coal Field: J. Squire (Montgomery, Ala.).—A Vertebrate Fauna of the Orkney Islands: T. E. Buckley and J. A. Harvie-Brown (Edinburgh, Douglas).—Manuel Pratique d'Analyse Bactériologique des Eaux: Dr. Miquel (Paris, Gauthier-Villars).—Outlines of Field Geology, 4th edition: Sir A. Geikie (Macmillan and Co.).—The History of Human Marriage: E. Westermarck (Macmillan and Co.).—Memorials of John Gunn: edited by H. B. Woodward and E. T. Newton (Norwich, Nudd).—Michigan Mining School Report 1886-91 (Marquette, Mich.)—Sommaire de Photogrammétrie: V. Legros (Paris).—Die Indo-Malayische Strandflora: A. F. W. Schimper (Jena, Fischer).—Vorlesungen über Maxwell's Theorie der Elektricität und des Lichtes, 1 Theil: Dr. L. Boltzmann (Leipzig, Barth).

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