achieved—if the Colleges and Polytechnics can be connected into one great educational machine—something worthy of the metropolis and of the Empire might be accomplished. The aims of the University of London will be, above all, practical. There should be great technical institutions which would prepare men for their work in life, and all who came within the range of the University should acquire something beyond the mere knowledge which enables them to take their parts in life.

THE connection between scientific knowledge and industrial progress was referred to by Mr. Balfour on Thursday last, in distributing the prizes and certificates to students at the Goldsmiths' Institute (see p. 136). He remarked, in the course of his address:—"I am but little qualified to speak by personal investigation or experience of the work of institutions like this; but there is one part of their labours in which I have always felt the deepest sympathy, from a strong sense of its transcendent importance—I mean the teaching which gives a sound and thorough scientific training to those who are engaged in any one of the many pursuits which have a genuine scientific knowledge at their base. I am quite sure that, if we were to gauge the deficiencies of British education as compared, let us say, with German education, they would be found more striking in this branch of education than almost in any other. I am strongly convinced that not only is the necessity of a thorough scientific training great at the present moment, but that the necessity is one which grows with every new discovery. There was a time when in reality theoretical scientific knowledge was wholly divorced from manufactures or any form of practical industry. That state of things has long passed away; and now the alliance between the most abstruse scientific investigations and the general manufacturing output of the country is becoming closer and closer. What was yesterday the curiosity of the laboratory will to-morrow be manufactured in the gross and exported from this country, or from other countries, to every quarter of the globe. And no mere surface knowledge, no mere acquaintance with the methods in fashion at a particular moment, can possibly replace that knowledge of principle which lies at the very root of all these discoveries, and which must be possessed by those who are to attain the greatest success, either as the guides and leaders of manufacturing industry or as the inventors who are to increase the sum of human happiness and health by the work of their brains." The Lord Chief Justice gave expression to similar views in an address delivered at the Rutlish Science School, Merton, on Monday. He remarked that there was not the smallest doubt that what was required in these days—not only in Great Britain, but throughout the British dominions—was a more accurate scientific teaching, a more practical scientific teaching. We were, at the present time, suffering from the fact that those in charge, not only of our commercial supremacy, but of our education, up to some ten or fifteen years ago, had not realised that other countries had discovered that the root of all successful commercial enterprise must be scientific knowledge and investigation.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 21.—"Observations on the Physiology of the Cerebral Cortex of some of the Higher Apes." (Preliminary communication.) By A. S. F. Grünbaum, M.A., M.D. Cantab., M.R.C.P., and Prof. C. S. Sherrington, M.A., M.D., F.R.S.

Our experiments have been carried out on individuals representing the four species *Pithecus satyrus* (Orang), *Troglodytes gorilla* (Gorilla), *Troglodytes niger* (Chimpanzee), and *Troglodytes calvus* (Chimpanzee). The specimens so far have included ten adult individuals.

I. *Method employed.*

The method of excitation employed for the cortex has been unipolar faradisation, in the manner previously adopted by one of us (Sherrington, Roy. Soc. *Proc.*, vol. lii., 1893) in examining the cortex cerebri for ocular reactions. This method allows of finer localisation than that possible with the double-point electrodes ordinarily used.

II. "*Motor*" (*so-called*) *Area.*

This area we find to include continuously the whole length of the precentral convolution. It also enters into the whole length of the *sulcus centralis*, with the usual exception of its extreme lower tip and its extreme upper tip.

In all the animals examined, we have found the "motor" area not to at any point extend behind *sulcus centralis*.

On the mesial surface of the hemisphere the "motor" area has extended less far down than was expected. It has not extended to the calloso-marginal fissure. Certain areas near that fissure have yielded us movements, *e.g.* of shoulder, body, wrist and fingers; but we hesitate, for reasons to be given in a fuller communication, to class those with those of the "motor" area proper.

We have found the precentral convolution excitable over its free width, and continuously round, into and to the bottom of the *sulcus centralis*. The "motor" area extends also into the depth of other fissures besides the Rolandic, as can be described in a fuller communication than the present. The hidden part of the excitable area probably equals, perhaps exceeds in extent, that contributing to the free surface of the hemisphere. We have in some individuals found the deeper part of the posterior wall of the *sulcus centralis* to contribute to the "motor" area.

In the "motor" area we have found localised, besides very numerous other actions, certain movements of the ear, nostril, palate, movements of sucking, of mastication, of the vocal cords, of the chest wall, of the abdominal wall, of the pelvic floor, of the anal orifice and of the vaginal orifice.

We find the arrangement of the representation of various regions of the musculature follow the segmental sequence of the cranio-spinal nerve-series to a very remarkable extent. The accompanying figure indicates better than can a verbal description the degree of adherence to this sequence.

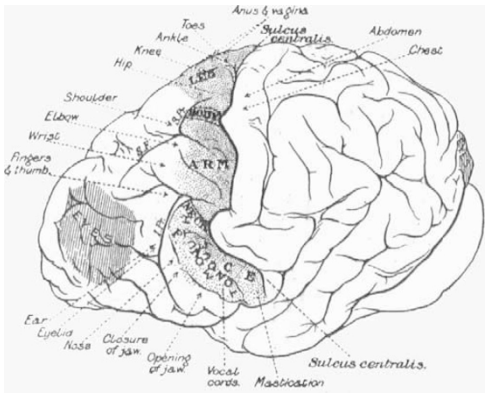

FIG. 1.—Brain of a Chimpanzee (*Troglodytes niger*). The extent of the "motor" area on the free surface of the hemisphere is indicated by the black stippling, which extends back to the *sulcus centralis*. There exists much overlapping of the areas and of their subdivisions which the diagram does not attempt to indicate. S.F. = superior frontal sulcus. S.Pr. = superior precentral sulcus. I.Pr. = inferior precentral sulcus.

We do not find that for the anthropoid brain the exciting current for the "motor" cortex requires to be extremely strong. "Epilepsy" is easily evoked from the cortex of the anthropoids.

Our experiments show that the *sulci* in the region of cortex dealt with can in no sense be considered to signify physiological boundaries. Further, the variation of the *sulci* in these higher brains is so great from individual to individual that, as our observations show, they prove but precarious, even fallacious, landmarks to the details of the true topography of the cortex.

Extirpation of the hand area by itself has been followed by severe paresis of the hand, the hand being for a few days practically useless and seemingly "powerless." In a few weeks use and "power" were remarkably regained in the hand, so that it was once more used for climbing, &c. The animal ultimately not unfrequently fed itself with fruit, making use of that hand alone. Even small ablations in the precentral gyrus have led to severe though quickly diminishing pareses. On the other hand, ablations of even large portions of postcentral gyrus have not given any even transient paresis.

III. *Other Regions of Cortex.*

Our observations indicate that the frontal region, yielding conjugate deviation of the eyeballs, presents such marked

differences of reaction from the "motor" area of the Rolandic region that we hesitate to include it with the so-called "motor" cortex. Spatially it is wholly separate from the Rolandic "motor" area by a field of "inexcitable" cortex. As to the occipital lobe, only from the extreme posterior apex of the lobe and from its actual calcarine region has faradisation yielded any movement (eyes), and then not easily.

The spinal degeneration resulting from ablation in the precentral gyrus of the above-mentioned "hand" area, discovers in the anthropoid cord the human feature of a perfectly large direct ventral (Türcksbündel) as well as crossed pyramidal tract. The relative sizes of these tracts seem about the same as in man.

"The New Biological Test for Blood in Relation to Zoological Classification," by George H. F. Nuttall, M.A., M.D., Ph.D. (Cambridge).

Attention is directed to experiments which prove the value of the biological test for blood in relation to zoological classification. The test is made by means of antisera, which are produced by injections of blood into various animals. If human blood, for example, is injected intraperitoneally into rabbits, the serum of the latter animals, after a course of such treatment, acquires the property of producing a precipitation when it is added to dilutions of human blood. By means of such anti-serum a positive reaction may be obtained with solutions of dried human blood. The anti-serum for human blood also acts on the blood of monkeys. The bloods of eighteen species of monkeys, representing the four families Hapalidæ, Cebidæ, Cercopithecidæ and Simiidæ, all reacted to human anti-serum. The bloods of the first two families (New World apes) gave less reaction than those of the two latter families (Old World apes). Upwards of 200 bloods from other animals gave no such reaction with human anti-serum. In other words, the test has established the existence of a *blood relationship*, as Dr. Nuttall terms it, between the apes and man. It will be remembered that Darwin considered the Old World apes to be more closely related to the Hominidæ than the New World apes, and the degree of reaction obtained with the latter bloods certainly supports this view. Among the bloods which gave no reaction with human anti-serum were those of two species of Lemur.

Similarly, dog anti-serum only produced a reaction in the blood of four other species of Canidæ. The anti-serum for ox and sheep blood only produced reactions in the bloods of other true ruminants (negative with Tragulus and Camelus), the anti-serum for horse blood only reacted with the blood of the horse and donkey, &c. These investigations are being prosecuted upon an extended scale.

Hitherto purely morphological characters have served for purposes of classification in the animal kingdom. We now possess a test whereby chemical differences may be determined between the bloods of different animals, as also, to a certain extent, between the bloods of related species, the differences in the latter case being quantitative. Dr. Nuttall believes that it will be possible by means of this test to determine certain relationships which have hitherto been considered obscure. It is certainly a remarkable fact that a fundamental chemical character has persisted in the bloods of all the Anthropoidea, in spite of the widely divergent modes of life and the different character of the food. Limited space prevents a consideration of the chemical nature of the reaction, but we might add that it is at present but imperfectly understood.

Physical Society, December 13.—Prof. S. P. Thompson, president, in the chair.—The following papers were read by the secretary:—On circular filaments or circular magnetic shells equivalent to circular coils, and on the equivalent radius of a coil, by Prof. T. R. Lyle. It is shown that we can represent the magnetic action of any coil by replacing it by one or more filamentary circuits in which currents circulate bearing a simple relation to the actual current in the coil. If the axial and radial dimensions of the coil in question are the same, then the external magnetic action can be represented by that of one filamentary circuit. If the axial breadth is greater than the radial depth we must employ two filaments of equal radii separated by an axial distance, and if the opposite condition holds, two circular filaments of different radii lying in the same plane perpendicular to the axis of figure of the coil. In the case of coils in which the axial and radial dimensions are equal, a modification of Bosscha's method is described which yields the equivalent radii directly as the result of length measurements. If the axial and radial dimensions are not equal, it is shown that the method is still applicable, provided that the ratio of the resistances of the Bosscha comparison be altered in a ratio depending on these dimensions. Apparatus for carrying out the experiment is described and applications to some classical cases are given. It is also pointed out that the correction for finite length of magnet in Bosscha's (or the present) method of comparison is in general far from negligible. The formulæ used are based on the expansion of the potential of a coil for points on its axis, and terms up to the fourth have been included, but the effect of neglecting higher terms is not investigated.—The secretary read a letter from Lord Rayleigh, in which he stated that the length of the magnet used in determining the constant of the current balance used in the determination of the electro-chemical equivalent of silver was one-tenth of an inch, and the error due to neglecting this was less than one part in ten thousand.—On air-pressures used in playing brass instruments, by Dr. E. H. Barton and Mr. S. C. Laws. It is well known that in playing upon the "brass" or "wood-wind" instruments of the orchestra the particular note, at any instant desired, is produced by the simultaneous use of the mechanism of the instrument and the corresponding "embouchure" through which air at a suitable pressure is driven by the performer. The object of the paper is to find how the air-pressure required to sound the different notes varies with (1) the pitch of the note, (2) its loudness, (3) the fingering or other manipulation of the instrument, (4) on the instrument itself. Experiments were made with the tenor trombone, the trumpet and the cornet, and the pressures were taken by a water-manometer connected to the performer's mouth by an india-rubber tube terminating in a glass nozzle, which could be held by the side teeth. The following inferences are drawn from the experiments: (1) Other things being equal, the louder the note the greater the pressure. (2) The higher the pitch of the note played on a given instrument the greater the air-pressure used. (3) The curves formed by plotting the logarithms of the frequencies of the notes as abscissæ and the pressures as ordinates are straight lines. (4) The air-pressure required to sound any note with given intensity is approximately proportional to its pitch defined logarithmically. (5) Where alternative positions or fingerings are used for the same note the pressures are practically the same. (6) The pressures for identical notes on trumpet and cornet are almost the same for any given intensity, but very much less than those for the same notes on the trombone. (7) The pressures used for loud low notes may exceed those for soft high notes.—On a new hygrometric method, by Mr. E. B. H. Wade. In this method a thermometer is wetted, not with water, but with sulphuric acid of such a strength that the temperature of the acid bulb is close to that of the dry bulb. The maximum tension of the acid at any temperature is known from Regnault's work, and two or more determinations with this instrument and with a wet and dry bulb hygrometer at the same time enable the constants of both instruments to be determined. If the difference between the acid bulb and the dry bulb is less than 2°, the constant remains fixed over a large range. Experiments show that the readings of the instrument are not affected by ventilation, and since the difference between the temperatures of the bulbs is small, errors in the determination of the constant are unimportant.

Zoological Society, December 3.—Dr. W. T. Blanford, F.R.S., vice-president, in the chair.—Mr. W. E. de Winton exhibited a remarkably large specimen of the grey mullet (*Mugil chelo*), said to have been taken in the North Sea.—A series of papers on the collections made during the "Skeat Expedition" to the Malay Peninsula in 1899–1900 was read. Mr. F. G. Sinclair reported on the Myriapoda, and enumerated the forty species of which specimens had been obtained. Of these, nine were described as new to science. Mr. W. F. Lanchester contributed an account of a part of the Crustacea, viz. the Brachyura, Stomatopoda and Macrura, collected during the expedition, and described six new forms. Mr. F. F. Laidlaw enumerated the snakes, crocodiles and chelonians which had been obtained, and described two new species based on specimens in the collection. An appendix to these papers, drawn up by Mr. W. W. Skeat, contained a list of names of the places visited by the members of the "Skeat Expedition."—Mr. F. E. Beddard, F.R.S., read a paper on the anatomy and systematic position of the painted snipe (*Rhynchaea*), based on an examination of specimens of this bird which had lately died in the Society's menagerie. The author was of opinion that *Rhynchaea* was more nearly allied to the Parridæ than to the

Scolopacinæ. In a second paper Mr. Beddard pointed out the structural differences between the common snipe (*Gallinago coelestis*) and the jack snipe (*G. gallinula*).—A communication from Dr. R. Bowdler Sharpe contained an account of the birds collected by Dr. A. Donaldson Smith during his last expedition to Lake Rudolf and the Nile.—Mr. G. A. Boulenger, F.R.S., described two new fishes under the names *Phractura ansorgii* and *Fundulus gularis*, recently discovered by Dr. W. J. Ansorge in southern Nigeria.

Aëronautical Society, December 3.—Mr. E. P. Frost in the chair.—Papers were read by Sir Hiram Maxim on aërial navigation by bodies heavier than air, by Mr. William Marriott on atmospheric currents, and by Mr. Eric Stuart Bruce on navigable balloons and the scientific aspects of M. Santos Dumont's experiments. Sir Hiram Maxim discussed the work done in navigable balloons by MM. Giffard and Renard. Renard made return journeys, but he never tried a petroleum motor. M. Santos Dumont had done so, had driven his balloon at the greatest pace yet attained, and returned to his starting-point in face of an adverse wind. His motor and balloon had strength and lightness as great as possible, and it did not seem probable they could be improved upon, so that his results seemed carried to the line beyond which no one could go. Turning to the consideration of flying by means of bodies heavier than air, in which, as yet, only a beginning has been made, Sir H. Maxim recapitulated the details of his own machine, relating his preparatory and subsequent experiments, which latter proved that a machine on a large scale could be made to develop a lifting effect greater than its own weight. The petroleum motor would now probably yield the best results. Now, too, there were aluminium alloys strong as wrought iron and light as aluminium, and at the time that he carried out his experiments engineers had nothing so good in their hands. He considered that a flying machine was not only now possible, but practicable.—Mr. W. Marriott, in his paper on atmospheric currents, explained climate and weather as meteorological terms, mentioned the instruments used for meteorological observations, dwelt on pressure records taken on the earth, alluded to the connection between heat and pressure, and by means of a series of charts explained the direction of currents in cyclones and anticyclones. A knowledge of the velocity and direction of winds in the upper air is needed, and he called upon the Aëronautical Society to here help meteorology. Speaking of the valuable kite-observation work of Mr. L. Rotch, up to a height of 8000 feet, Mr. Marriott said that at present a free balloon drifting with the wind can obtain no record of wind pressure or wind velocity; it can only ascertain the direction of the upper currents.—Mr. Eric Stuart Bruce pointed out that for the first time in history M. Santos Dumont had succeeded in steering a balloon from a given point to a given point in a given time. His ingenuity and originality had enabled him to make a real, though small, advance in practice in overcoming the force of the wind; the observations on the Eiffel Tower showed that on the day he won the Deutsch prize the velocity of the wind during his balloon journey was from four to five metres per second. In future navigable balloon competitions, Mr. Bruce thought it should be made a condition that the trials took place when the wind-force was not below a certain value.

Linnean Society, December 5.—Dr. D. H. Scott, F.R.S., vice-president, in the chair.—Dr. W. G. Ridewood exhibited nine specimens of abnormal sacra in the edible frog (*Rana esculenta*) and one in the common frog (*Rana temporaria*).—Dr. J. H. Salter read a paper on protoplasmic connections in the lichens. The author stated, in conclusion, that the observations tended to show that a complete anatomical union exists between the several tissues of the lichen thallus, due to the innumerable connections which may be traced between the ultimate histological units, the segments of the hyphæ. Many physiological problems are simplified, and a new conception is obtained, by our ability to recognise the essential unity of the living matter throughout the organism.—Mr. F. Chapman read a paper on the foraminifera collected round the Funafuti Atoll from shallow and moderately deep water; with notes on new species from the sands of the reef slope. The descriptions were based on material collected by Profs. Sollas and Edgeworth David, and included samples from the beaches down to 200 fathoms and also from the reef slope. They serve as an index to the forms found in the reef-boring. Some idea of the richness of the dredgings may be gathered from the fact that no less than 273 distinct forms are recorded from the dredgings taken between 16 and 200 fathoms. From these samples fourteen new species and varieties have been described.

PARIS.

Academy of Sciences, December 9.—M. Fouqué in the chair.—On the connection of algebraic surfaces, by M. H. Poincaré.—Studies on radium, by M. Berthelot. A detailed study of the action of radium salts upon iodic anhydride. The experiments were carried out at two temperatures, 10° and 100°; blank experiments were carried out, always in the dark, in such a manner as to distinguish between the effects of the phosphorescence produced by the radium and the effects produced by the radium rays in the absence of this phosphorescence. In the case of the iodic acid submitted to the action of the radium tube wrapped round with black paper, that is, protected from the phosphorescence, no reduction took place, whilst in the tube not thus protected iodine was formed. The amounts produced were of the same order of magnitude as the effects observed previously by M. Curie and M. Becquerel.—On the radio-activity of uranium, by M. Henri Becquerel. The observations published by Crookes and by Giesel would tend to show that the activity of uranium may be due to the presence of a small quantity of a very active compound, and that uranium itself is really inactive. This, however, is hardly consistent with the fact that the radio-activity of a commercial uranium salt, whatever may have been its origin, is practically constant. In some earlier work, some uranium salt was fractionated and the radio-active effects concentrated in certain fractions; after the lapse of about eighteen months these fractions were re-examined and were found to have practically the same activity. The lost activity is thus regained spontaneously. A hypothesis is developed which is in accord with most of the observed facts.—The production and maintenance of low temperatures, by M. d'Arsonval. For temperatures down to about $-110°$ the use of solid carbonic acid or acetylene in acetone is recommended, and the necessary precautions given for the maintenance of a steady temperature. For lower temperatures liquid air must be used; it has been found possible to use a bath of carefully rectified petroleum spirit, which remains liquid even at $-194°$.—Remarks by M. Dehérain on his treatise on agricultural chemistry.—On persistent conjugated systems, by M. A. Demoulin.—On transcendental equations and numbers, by M. Edmond Maillet.—The determination of the observed heights of shooting stars in August, 1901, between the Observatory of Juvisy and the auxiliary station of Antony (Croix-de-Berny), by M. C. Flammarion. The results of the measurements of eight meteors are given, the heights of the first appearance varying between 119 and 15 kilometres, and the heights of the disappearance varying between 68 and 14 kilometres.—A method allowing of the determination of the true velocity of navigable aërostats, by M. H. Deslandres.—A note completing that of November 25 and giving the trace of the trajectory on the ground, with an approximation of about 1/25, of the course of M. Santos Dumont's aërostat on the trial of October 19, by M. J. Armengaud, jun.—The influence of stray currents upon the terrestrial magnetic field, by M. Th. Moureaux. It has been found that in spite of the employment of deadening apparatus the establishment of electric tramways affects, not only the diurnal variation, but also the absolute magnetic elements.—On the auscultation of storms and on the study of the diurnal variation of atmospheric electricity, by M. Th. Tommasina.—On the alloys of aluminium and magnesium, by M. O. Boudouard. The compound Al_4Mg was isolated, and its properties are given. Particulars are also given of the preparation and properties of $AlMg_3$ and AlMg.—On the alloys of strontium with zinc and cadmium, by M. Henri Gautier.—On the state of silicon in cast iron and in ferrosilicons containing a small amount of silicon, by M. P. Lebeau. The compound SiFe cannot exist in the presence of an excess of iron and consequently cannot form a constituent of siliceous cast irons. All the silicon in cast iron would appear to be in the state of the silicide $SiFe_2$.—On a practical means of obtaining trichlorbutyl alcohol, by M. Marcel Guédras. Trichlorbutyl alcohol is prepared by the action of caustic potash upon a mixture of acetone with chloroform. This alcohol is a local anæsthetic, and also possesses antiseptic properties.—On the nutrition of the embryo at the expense of the cotyledons, by M. G. André.—The structure of the lymphatic ganglions of the goose, by MM. L. Vialleton and G. Fleury.—The inoculation of cancer from man to the white rat, by M. Mayet.

—On the existence in cold-blooded animals of a regulating apparatus for heat, by M. J. P. Langlois. Reptiles with impermeable skin have the power of regulating their temperature when it reaches 39° and when the calorific rays strike the head directly.—On the salutary effects of potatoes substituted for bread in diabetics in high doses sufficient to maintain the equivalence of the food ration, by M. A. Mossé. The carbohydrates which may be given to diabetics can be divided into three classes—harmful, indifferent and doubtful—and the potato has been generally placed in this last group. From the experiments here described, the author concludes that the potato is not only permissible, but useful, and may be advantageously substituted for bread.—Organic variations in the hen with respect to its food, by M. F. Houssay.—On the transformations of the germinative vesicle in lizards, by Mlle. Marie Loyez.—Properties of the liberoligneous chains in ferns, by MM. C. E. Bertrand and F. Cornaille.—A contribution to the study of a new disease of the potato produced by the *Bacillus solancola*, by M. G. Delacroix.—The influence of nutritive mineral salts on the production of nodosities in peas, by M. E. Marchal.—Conclusions to be drawn from the study of the series of homogeneous enclosures in a volcanic rock; the series of homogeneous enclosures in the andesites from Mont-Dore, by M. A. Lacroix.—The gases of the blood at different altitudes during a balloon ascent, by MM. J. Tissot and Hallion. The decrease of atmospheric pressure caused by a balloon ascent causes a sensible increase in the power of absorbing oxygen possessed by the hæmoglobin; up to 3500 metres the carbonic acid contained in the blood does not follow the law of solution of gases, on the contrary it varies in the inverse sense. The nitrogen in the blood follows the ordinary laws, the amount diminishing as the pressure is reduced.—Reproductions of the Palæolithic drawings engraved on the walls of the cave of Combarelles, by MM. Capitan and Breuil. The paper is accompanied with reproductions of drawings of a horse, reindeer, mammoth and bison.

New South Wales.

Linnean Society, October 30.—Mr. J. H. Maiden, president, in the chair.—On *Eucalyptus pulverulenta*, Sims, by Mr. J. H. Maiden. The author shows that *E. pulverulenta*, Sims, is conspecific with the "apple or peppermint" of Victoria (one of the trees known as *E. Stuartiana*, F.v.M.) and the "red or black peppermint" of New England (*E. nova-anglica*, Deane and Maiden), both of which he considers to be lanceolar-leaved forms of the species.—On *Eucalyptus Stuartiana*, F.v.M., by J. H. Maiden. The author shows that at least three species of trees have passed under this name, and expresses regret that it is not possible to obliterate the name from the list of species. As this is out of the question, he reiterates the former recommendation of Mr. Deane and himself that its use be confined to the "apple or but but" of Victoria and to the "apple or white peppermint" of New South Wales, the species that probably extends over a greater area than that of any of the other plants included under the name, and the one which was perhaps most frequently named *E. Stuartiana* by Mueller himself.—On *Eucalyptus Gunnii*, Hook. f., by Mr. J. H. Maiden. The author divides the species into the type-form and four varieties, viz., vars. *acervula*, *ovata*, *rubida* and *maculosa*.—The gum-fermentation of sugar-cane juice, by Mr. R. Greig Smith. The viscosity that occasionally develops in cane juice during the manufacture of sugar has been traced to *Bacillus levaniformans*, n. sp., which ferments saccharose producing gum, a mixture of reducing sugars, carbon dioxide and a mixture of acids. Neither mannite nor alcohol is formed. In a culture medium containing 100 grms. saccharose, 1 grm. peptone and salts dissolved in a litre of water, 31 grms. gum and 60 grms. mixed reducing sugars were produced in seven days at 37° C. The gum is formed from saccharose, but not from lactose, dextrose, levulose, maltose, starch or vegetable infusions without saccharose. Peptone increases the gum and acids relatively, and decreases the mixed reducing sugars. The fermentation goes on, though slowly, in weak peptone (·001 per cent.) solutions. The chemical and optical properties of the gum, which is probably the diffluent capsule of the bacillus, show it to be different from inulin, levulan and other previously described gums; it has, therefore, been named levan. Carbon dioxide is produced in good amount, 1·28 grms. being formed from 100 grms. saccharose in five days. The acids are comparatively small in amount, and consist of active and inactive lactic, butyric, acetic, formic and capric acids. These occur in the ratio of about 60 of lactic acid to 1 of the rest. Many races of *Bac. levaniformans* were separated from other sources, and these showed that the organism is related to the potato group of bacilli as a whole and not to any one so-called species.—The chemical properties of bacterial gum levan, by Mr. Thos. Steel. The chemical properties of levan, the new gum produced by the action on sugar of the bacillus described by Mr. R. Greig Smith in the preceding paper, are described. The relationship of levan to other similar known substances is detailed, and it is shown to differ in important respects from inulin, the body which it most nearly resembles generally. The gum found in sugar-cane suffering from the well-known "gumming" disease is quite distinct from levan.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 19.

LINNEAN SOCIETY, at 8.—On the Brain of Recent and Fossil Lemurs: Dr. G. Elliot Smith.—On the Ostracoda collected round the Funafuti: F. Chapman.—Exhibitions: A Gigantic Argulus from Japan and a Specimen dredged at the Cape: Prof. G. B. Howes, F.R.S.—A New Polyzoon from Tanganyika: J. E. S. Moore.—An Example of White's Thrush (*Turdus varius*), shot near Clavering, Essex: Miller Christy.

CHEMICAL SOCIETY, at 8.—(1) Corydaline. Part VII. The Constitution of Corydaline; (2) The Relation of Corydaline to Berberine. The Oxidation of Berberine with Nitric Acid: J. J. Dobbie and A. Lauder.—The Magnetic Rotation of some Polyhydric Alcohols, Hexoses, and Disaccharoses: W. H. Perkin, F.R.S.—Stereoisomeric Halogen Derivatives of α-benzoylcamphor: H. O. Forster and F. M. G. Micklethwait.—Is Argon an Elementary Substance? G. Martin.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Some Principles underlying the Profitable Sale of Electricity: Arthur Wright.

INSTITUTION OF MINING AND METALLURGY, at 5.—The Titration, Use and Precipitation of Cyanide Solutions containing Copper: Walter H. Virgoe.—Ore in Sight: J. D. Kendall.—Continuous Section System Mine Sampling: M. H. Burnham.

FRIDAY, DECEMBER 20.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Transmission Dynamometers: A. M. Morgan.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—The Microscopical Examination of the Alloys of Copper and Tin: W. Campbell.

CONTENTS.