they began late, and they had not yet caught up some other nations, and much had still to be done in this country in order to provide the facilities that were needed to furnish their sons with the knowledge that was necessary to enable them to carry on the commercial business of the country. The City and Guilds Institute had in the most munificent manner spent on its technical colleges in the course of the past eighteen years about half a million out of the funds over which it had control; but could they go on relying upon private munificence so much as they had done for the purposes of technical education? He ventured to think that the time had come when there should be some system supported by funds, if necessary, of some public nature by which colleges should be founded in the great centres where they were needed, and branch colleges of a similar description in smaller places where they were wanted. The whole scheme of technical education seemed to him to have come to the point at which it required some further consideration. In connection with this subject one had often to speak of Germany and Switzerland, but he was quite sure that they did not speak of them in any spirit of jealousy, but, on the contrary, in a spirit of admiring emulation of their work. They must take what they could that was best from those countries and adopt it, and leave the latter to act in a similar manner towards this country.

SCIENTIFIC SERIALS.

American Journal of Science, January.—A new harmonic analyser, by A. A. Michelson and S. W. Stroud. This is an instrument designed to sum up as many as eighty terms of a Fourier series, or to analyse a given curve into its original series. The pen which traces the curve is worked up and down by a lever controlled by a spring. This spring is stretched by an excentric, which imparts a "simple harmonic" variation to the force. The stretching is resisted by another spring. Eighty such elements are connected together, with one resisting spring to counterbalance the sum of the elementary springs. The pen therefore moves in accordance with the sum of the elementary periodic motions. The authors obtain by this machine the mathematical series representing the profile of a human face.—A new form of physical pendulum, by J. S. Stevens. The error introduced into the ordinary physical pendulum by the fact that the knife-edges and clamp affect the moment of inertia may be eliminated by boring a hole into the rod and screwing the knife edges a little way in, so that they offset the mass of brass bored out.—The Protostegan plastron, by G. R. Wieland. This is a restoration of the plastron of two specimens of the turtle described before as *Archelon ischyros*.—Phosphorescence produced by electrification, by J. Trowbridge and J. E. Burbank. When a piece of fluorspar is first exposed to the action of X-rays, and subsequently heated, it shows a bright phosphorescence. The same phenomenon may be produced by exposing the mineral to an electric brush discharge, and subsequently heating it. It is probable, therefore, that the X-rays produce an electrification of the fluorspar.—On iron meteorites, as nodular structures in stony meteorites, by H. L. Preston. It is an important fact that of over 100 falls and finds of siderites or iron meteorites but nine have been seen to fall, while of the aerolites or stony meteorites of over 400 falls and finds, more than one-half have been seen to fall. The author gives several reasons in support of the view that the siderites are merely the crystallised metallic nodules contained in the larger and more conspicuous stony meteorites.

SOCIETIES AND ACADEMIES.

LONDON.

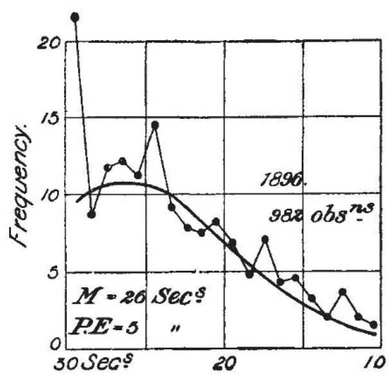
Royal Society, December 13, 1897.—"An Examination into the Registered Speeds of American Trotting Horses, with Remarks on their Value as Hereditary Data." By Francis Galton, D.C.L., F.R.S.

It is strange that the huge sums spent on the breeding of pedigree stock, whether of horses, cattle, or other animals, should not give rise to systematic publications of authentic records in a form suitable for scientific inquiry into the laws of heredity. An almost solitary exception to the disregard shown by breeders and owners, of exact measurements for publication in stud books, exists in the United States with respect to the measured speed of "trotters" and "pacers" under defined conditions. The performance of one mile by a trotter, harnessed to a two-wheeled vehicle, carrying a weight of not less than 150 lbs. inclusive of the driver, in 2 minutes 30 seconds qualifies him for entry in the "Trotting Register," giving him, as it were, a pass-degree into a class of horses whose several utmost speeds or "records" are there published.

The system of timing was first put into practice more than fifty years ago, and has since been developed and improved. In 1892 a considerable change was made in the conditions by the introduction of bicycle wheels with pneumatic tyres, which produced a gain of speed, the amount of which is much discussed, but which a prevalent opinion rates at 5 seconds in the mile. Thenceforward the records are comparable on nearly equal terms. All trotting performances up to the 2′ 30″ standard are registered in the large and closely printed volumes of "Wallace's Year Book," published under the authority of the American Trotting Association. Vols. viii.-xii. refer to the years 1892-6, and it is from the entries in these that the following remarks are based.

The object of my inquiry was to test the suitability of these trotting (and pacing) records for investigations into the laws of heredity. I had to determine whether the observations fell into a tolerably smooth curve; and, if so, whether that curve was a tolerable approach to the normal curve of frequency. In the latter event the observations would fall into line with numerous anthropometric and other measures which have been often discussed, and which, when treated by methods in which the arithmetic mean is employed, yield results that accord with observed facts.

I had 5705 extracts made from the entries published in the Year Books for the five years 1892-6. It was tedious work, and I thought it unnecessary to repeat it to check the results, being satisfied after some examination that they were quite accurate enough for general conclusions. They were arranged in columns; the first to the left contained entries of all observations recorded as 2′ 29·0″, 29¼″, 29½″, or 29¾″; that is of all under 2′ 30″ down to 2′ 29″ inclusive. The second column referred to 2′ 28″·0, 28″¼, 28″½, and 28″¾, and so on with the rest. These were then reduced to percentages and diagrams were drawn from them, of which the following, for the year 1896, is one; it will serve as a fair sample of the other four.



If divided by the eye into imaginary columns corresponding to those in the tables, the point representing the sum of the observations of 2′ 29″·0′, 29″¼, 29″½ and 29″¾ will be found in the middle of the first imaginary column, that is to say it stands vertically above the point that lies half way between 29 and 30 on the scale along the base. The dots are connected by thin lines to show the trace or curve of the observations. The smooth curves are those of normal frequency, calculated from the values of the mean (M) and of the probable error (P.E.), which are given in the diagrams.

Leaving aside for the moment the strange pinnacle that rises on the extreme left of every diagram, we see that the traces of the rest of the observations run very roughly, but not intolerably so. In each diagram they seem to be disposed about a fundamentally smooth curve. Considering the smallness of the interval, namely, only one second, that separates the observations assigned to each pair of successive columns, together with the experience derived from other kinds of statistical curves, it seems to me that the run of the observations is good enough to certify their general trustworthiness. As regards the pinnacle it is different matter, and is one which when beginning work, as did, on the 1892 entries only, was very perplexing. However, by persevering with the other years, it became increasingly plain that the pinnacle was a false maximum; in 1896 it was certain that the true maximum lay well within the portion of the curve included in the diagram. The explanation of the pinnacle then became obvious[1]; it was that the tolerance granted to those horses who failed by only a little to qualify themselves, was extended considerably beyond the quarter second for which I was prepared. The cases of 2′ 30·0″ were few; they do not appear in the diagram, but their addition would be quite insufficient to remove the difficulty, If the pinnacle were distributed among *two* adjacent columns outside and to the left of the diagram it would smooth away the incongruity, so I suspect that cases of "under 2′ 32″ and down to 2′ 30″" are habitually rated at a trifle less than 2′ 30″. Consequently I had no hesitation in wholly disregarding the entries that helped to make the pinnacle, namely, the whole of those contained in the first column to the left in every one of the diagrams. The course thereupon became clear and straightforward. I estimated the position of the mean value for each year, from inspection of the curve of that year, allowing myself to be somewhat biassed in estimating its point of culmination by the curves of the adjacent years; similarly as to the probable error. Now that the curves are drawn, I see that somewhat better fits might have been made, but they are close enough to show the existence of a fair amount of correspondence between the observed values and those calculated according to the law of normal frequency. It is near enough to remove hesitation in working with the arithmetic mean.

I now come to the fundamental purpose of this memoir, which is to point out the existence in the registers of the American Trotting Association, of a store of material most valuable to inquirers into the laws of heredity, which accumulates and increases in value year by year. But it seems to me hardly worth while to discuss hereditary influence on speed in horses, unless the records of at least their sires and of their dams, and those of each of their four grandparents, as well as their own record, are all known. Even in this case (according, at least, to my own theory) one quarter of the hereditary influences are unknown and have to be inferred. It is practically impossible to make an adequate collection of the names of horses who fulfil the above conditions out of the entries in the "Trotting Register," each search requiring many cross references and occupying a long time, while the number of futile searches before attaining a success is great. On the other hand, the breeders and possessors of these notably bred horses must be familiar with the required facts, and would assuredly be delighted to have them known. There need, therefore, be little difficulty in obtaining materials for the much desired table. In the meantime I am sending circulars to the chief breeders in America, in hopes of making a start.

The great need for genealogical data of an exact numerical kind, by those who prosecute inquiries into the laws of heredity, is the justification that I offer for submitting these remarks to the Royal Society.

[1] I should like to take the opportunity afforded by the appearance of an abstract of my memoir in NATURE to correct a questionable suspicion, namely, that the pinnacles in the diagrams are due to tolerance shown towards horses who failed by a very little to qualify for the much-coveted rank of standard trotters. I am assured on excellent authority that the strict conditions of timing make this impossible (among other reasons there are three timers). On the other hand, there is a vast competition *just* to pass the 2′ 30″ limit; and when a horse has done so, his owner often does not care to train him for racing, but rather to utilise him at once for breeding or other purposes. The question is too complicated to discuss here at length. Suffice it that the 2′ 29″ to 2′ 30″ records are not homogeneous with the rest, and should be discarded as I proposed.—F. G.

Physical Society, January 21.—Mr. Shelford Bidwell, President, in the chair.—Prof. Fitzgerald exhibited some photographs by Mr. Preston in illustration of the Zeeman effect, for various cases, including those of iron, cadmium, zinc, and sodium. These photographs and the method of obtaining them have already been described. The cause of doubling is now attributed by Prof. Fitzgerald to absorption by the surrounding vapour. In a particular case he examined a double line that exists in one of the photographs. Under the polariser the two lines are at first distinctly seen; but when the polariser is turned, a thin line appears in the middle, and this central line is, therefore, circularly polarised in a direction opposite to that of the outer pair of lines. The reason for the appearance of doubling in the first position of the polariser is that the central line is there completely absorbed out by the surrounding vapour.—Prof. Oliver Lodge then gave a communication concerning his work on "Electric Signalling without Connecting-wires." From the nature of the oscillatory disturbances emanating from any of the customary forms of Hertz vibrator, syntony has hitherto been only very partially available as a means for discriminating between receivers. There is in fact so rapid a decrease in the amplitude of the vibrations that almost any receiver can respond to some extent. Discrimination by syntony is possible with magnetic systems of space telegraphy where the magnetic energy much exceeds the electric, *i.e.* as between two separated inductive coils; and by the use of such coils, appropriately applied, the author has been able to attain fair syntony even with true Hertz waves, *i.e.* he has constructed spark-gap oscillators, with sufficient persistence of vibration, and syntonised resonators. The "coherer" principle can be applied to either a purely magnetic or to the Hertzian system. It was first used by Prof. Lodge in devising lightning-guards, and afterwards in his magnetic system of telegraphy by inductive circuits, each in series with a Leyden-jar; a pair of knobs in near contact, or other over-flow gap, being provided in the receiving apparatus. This was the first meaning of a "coherer" in the electrical sense as used by Prof. Lodge. It referred to a *single* contact between two metal knobs. The term has since been extended by others to the filings-tube of M. Branly, and some confusion has arisen, for M. Branly does not consider that simple coherence and break explains fully the behaviour of his instrument. Prof. Lodge is disposed to agree, for he finds that the resistance of almost any form of coherer varies in rough proportion to the received impulses, and that there are other peculiarities (to be mentioned later). He is, therefore, inclined to think that the action cannot after all be entirely explained as due to mere "welding," but that there is something more to be learnt about it. The sensitiveness of a coherer depends upon the number of loose contacts; it is a maximum for a single contact, *i.e.* for a needle-point lightly touching a steel spring. With this sensitive coherer, hardly any "tapping-back" is required for decoherence, but it wants delicate treatment when properly adjusted, and the greatest current through it should not approach a milliampere. On the other hand, a Branly tube rather improves under rough treatment; in such a tube the author prefers to use iron filings in the best possible vacuum; brass, too, is very good, but rather less easy to manage. Aluminium is thoroughly bad, and gold, for an opposite reason, will not work—its surface is too clean. Points, or small surfaces for making contact with the filings, are better than large surfaces. The usual method of connecting the coherer across the gap of an ordinary Hertz receiver, in parallel with the telegraph instrument and battery, has the unavoidable objection that they shunt away part of the received oscillations. With the syntonic receiver of Prof. Lodge, which contains no gap, but a closed wire coil instead, this difficulty no longer exists; for the coherer can now be in series with the detecting instrument, and in so far as these obstruct the oscillations they may be shunted out in various ways, as the author describes. The main feature of his new syntonised vibrators is this self-inductance coil, whose function it is to prolong the duration of the oscillations, and thereby to render syntony possible. Although such a coil acts disadvantageously in so far as it possesses resistance, the resistance does not increase so fast as the self-induction. The coil should consist of thick copper of highest conductivity, and it should have maximum inductance for given resistance. For similar reasons, the capacity-areas should also be of highest conductivity, their dimensions should increase outwards from the spark-gap, as triangles. The receiver must have no gap, it should be accurately bridged over when a transmitter is used as receiver. The limit of speed of response depends upon the telegraphic instrument. Dr. Muirhead adapted a siphon-recorder to the purpose, because it is one of the quickest responders; he arranged it so that it could be used with intermittent currents direct. Under these intermittent impulses the siphon trembles; and instead of the ordinary siphon-signals, the slip is marked with dots and dashes. Constant mechanical tremor is usually employed for decoherence, but the author finds that decoherence can be brought about by electrical means, without any mechanical tremor, by connecting the coherer momentarily to a circuit less effective as a collector than that of the proper capacity-areas of the syntonised receiver. The battery and galvanometer detector-circuit may be used for this purpose, the coherer being momentarily connected to it, and while so connected letting it experience an impulse from a distance. Prof. Lodge has designed a revolving commutator by means of which the coherer can be rapidly changed over from the resonating circuit to the instrument-circuit, and finally to the "tapping-back" apparatus. A coherer is more sensitive when thus isolated and exposed to the full influence of the received oscillations; the subsequent detection of the effect by altered connections is very convenient for laboratory measurements. A diagram of a series of plotted measurements showed that the resistance of an undisturbed filings-tube is approximately a direct function of the intensity of the received stimulus, whether successive stimuli increased or decreased in strength. This electrical process of "tapping-back" is to be depended upon, but the process long continued fatigues the tube until a mechanical shake is employed to restore it. Large size apparatus made by Dr. Muirhead for actual distant syntonic work was exhibited, and means were shown for protecting and isolating the coherer when its receiving areas were being used as emitters; also a switch used for changing at one moment all the connections from "sending" to "receiving." Prof. Threlfall said he had come to the same conclusion as Prof. Lodge as to the advisability of diminishing the number of contact-points in the coherer. He had endeavoured to produce longer and more persistent waves, and thus to set afield greater effective energy. It was desirable to keep the waves as parallel as possible. He thought there was some probability that the wave-fronts could be altered and rendered more conformable by a process of diffraction. Mr. Rutherford also had found it best to work with long waves. He fully appreciated the advantage of increasing the capacity of the oscillator by extending the surface of the metallic plates. Mr. Campbell-Swinton asked whether experiments had been made to verify Hertz results as to the influence of reflectors behind oscillators and receivers. He had found them disadvantageous. A single wire behind either apparatus seemed partially to annul the effect. He also asked whether Prof. Lodge had observed the extraordinary sensitiveness of coherers to small changes of current in neighbouring circuits. Prof. Lodge, in reply, said he had observed the sensitiveness to slight sudden variations of current referred to by Mr. Campbell Swinton; for instance, when electric lamps were switched on or off. The effect of mirrors had been studied by Prof. Fitzgerald. They required to be of large dimensions as compared to the oscillator and receiver, otherwise the true reflections were not obtained. Dr. Silvanus Thompson afterwards exhibited a Tesla oscillator. This apparatus is intended to replace the two induction coils and spark-gap arrangements used by Mr. Tesla for high-frequency experiments. It consists of an induction coil with a separate self-inductance coil in the primary circuit. This self-inductance coil is also used as an electromagnet for the separate interrupter of the primary circuit. A condenser is connected between one end of the primary coil and one terminal of the interrupter, so as to include both of them between its terminals. The primary is a single turn of copper strip, six inches wide. The secondary is one layer of thick wire; each turn separated from the next by an air space. The supply current, about half an ampere, may be taken from the electric-light mains at almost any voltage from 50 to 200, direct or alternating. Prof. Lodge said it would work quite well at 10 volts. He pointed out also that if the straight discharge-rods at the spark-gap were free to slide, the discharge drove them back into their sockets. Prof. Fitzgerald said it was stated at Toronto that the spark was broken at the interrupter when the condenser was charged, and that by the time the condenser was ready to discharge, the contact at the interrupter had been made again. It seemed to him that the condenser discharges and surgings must take place at a rate far higher than the period of the mechanical movement of the interrupter. The condenser charges and discharges were very rapid. It was not what is ordinarily called the "time constant" that was involved, for that only referred to constant voltage. Here the voltage was changing very rapidly indeed. Prof. Herschel asked if such an apparatus was suitable for work with Röntgen rays. Dr. Thompson, in reply, congratulated Mr. Tesla upon the perfect working and compactness of his invention. The present form was not suited for Röntgen ray experiments, but Mr. Tesla had designed a special coil that was excellent for that purpose. —The President proposed votes of thanks, and the meeting was adjourned until February 11.

PARIS.

Academy of Sciences, January 24.—M. Wolf in the chair. —On the reduction of some double integrals, and on a new invariant in the theory of algebraic surfaces, by M. Émile Picard.—Addition to a preceding note on the Zeeman effect, by M. A. Cornu. Some results of measurements showing that the magnitude of the separation produced increases with the refrangibility of the ray.—On the conditions of formation of alkaline carbides, and the carbides of magnesium and of the alkaline earths, by M. Henri Moissan. Metallic potassium, if left for a long time in acetylene, slowly but completely decomposes the gas giving hydrogen and C_2HK. Sodium gives a similar compound when sealed up with liquid acetylene, and this C_2HNa, heated in a vacuum, gives up pure acetylene, leaving sodium carbide C_2Na_2 behind; at a red heat this is decomposed into carbon and sodium. The potassium compound behaves similarly, neither sodium, potassium, nor magnesium carbides being able to exist at the temperature of the electric furnace.—Histological mechanism of cicatrisation; on true immediate reunion, by M. L. Ranvier. In wounds caused by cutting the cornea of the rabbit, two modes of closing up of the tissue can be noted, an immediate synaptic joining, and a true immediate joining, the former due to the cuts being filled with epithelial cells arising from the neighbouring epithelium, and the latter noticeable only in wounds forty-eight hours after the incision had been made, and where, owing to the lips of the cut happening to touch, no epithelial cells had penetrated.—The enlargement of the right auricle of the heart during inspiration demonstrated by radioscopy, by M. Ch. Bouchard.—On the fourth voyage of the *Princesse-Alice*, by S.A.S. Albert I., Prince of Monaco. The chief work was done on the western coast of Morocco, round Madeira and the Azores, and comprised sounding operations, together with zoological study of the fauna of the Princesse-Alice bank. A chart of this bank accompanies the paper.—Remarks by M. Edmond Perrier on his work on animal colonies and the formation of organisms.—Shooting-stars in the months of November and December 1897, observed at Basse-Terre (Guadeloupe), by M. Ch. Duprat.—On the development of uniform or holomorphic functions in any field, by M. Paul Painlevé.—On the types of increase and on complete functions, by M. Émile Borel.—On systems of partial differential equations analogous to equations of the first order, by M. Jules Beudon.—On the geometry of magnetic fields and of motion with two degrees of freedom in a plane or on a sphere, by M. René de Saussure.—Law of deformation of commercial metals, by M. Marcel Brillouin. A mathematical expression is given which includes all the known facts regarding permanent changes of shape in metals.—On an interference spectroscope, by MM. Ch. Fabry and A. Perot. The method consists in observing rings produced by transmission through a layer of air contained between two perfectly parallel silvered glass faces. Full details of the adjustments necessary are given in the present paper.—On the part played by diffraction in the effects produced with gratings, by M. Ch. Féry.—Study of chemical and physical equilibria by the osmotic method, by M. A. Ponsot.—On the law of mixture of gases, by M. Paul Sacerdote, giving the experimental results of mixing equal volumes of gases. The observed changes of pressure for a mixture of nitrous oxide and carbon dioxide, and of the latter gas with sulphur dioxide, are compared with those deduced from the densities by M. Leduc. The results of the two methods are in general agreement.—On the separation of thorium and the cerite earths, by MM. G. Wyrouboff and A. Verneuil.—The method proposed is based upon the fact that in a mixture of nitrates of the rare earths, as free as possible from excess of acid, heating with excess of hydrogen peroxide to 60° completely precipitates all the thoria in the solution.—Hydramides and the isomeric glyoxalidines, by M. Marcel Delépine. A thermochemical paper.—Researches on ouabaïne, by M. Arnaud.—Synthesis of terebic acid, by M. E. E. Blaise.—Manufacture of acetone oil, in particular of methyl-ethyl-ketone, by means of the liquors from the desuintage of wool, by MM. A. and P. Buisine. The calcium salts of the mixture of fatty acids obtained from wool is submitted to dry distillation. The resulting liquid yields on fractionation 60 per cent. of methyl-ethyl-ketone. —On the estimation of gastric juice, by M. L. Cordier. The free acid is converted into lithium chloride by treatment with lithium carbonate, and this separated from the sodium chloride by extracting the incinerated residue with a mixture of equal parts of absolute alcohol and dry ether, in which the lithium chloride only is soluble.—Ergographical experiments for measuring the maximum power of a muscle regularly stretched, by MM. André Broca and Charles Richet.—The fungus *Sporotrichum globuliferum*, by M. Trabut.—On the anhydrous calcium sulphate produced by the complete dehydration of gypsum, by M. A. Lacroix. The dehydration of gypsum gives rise to a calcium sulphate dimorphous with anhydrite, probably triclinic. When the drying was not quite carried to completion another form of crystal was observed, possibly $2CaSO_4.H_2O$.—On the Callovian of Woëvre, by M. René Nicklès.—On the third international ascent of experimental balloons, by M. Ed. Stelling. Two ascents were made, one with two observers, the other balloon carrying self-registering instruments only. The temperature variation with the height is given in full.

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 3.

ROYAL SOCIETY, at 4.30.—Comparison of Oxygen with the Extra Lines in the Spectra of the Helium Stars β-Crucis, &c.; also Summary of the Spectra of Southern Stars to the 3½ Magnitude and their Distribution: F. McClean, F.R.S.—Researches in Vortex Motion. Part III. On Spiral or Gyrostatic Vortex Aggregates: Prof. W. M. Hicks, F.R.S.—The Pharmacology of Aconitine, &c., considered in relation to their Chemical Constitution: Prof. Cash, F.R.S., and Prof. Dunstan, F.R.S.—Note on the Experimental Junction of the Vagus with the Cells of the Superior Cervical Ganglion: Dr. J. N. Langley, F.R.S.

ROYAL INSTITUTION, at 3.—The Halogen Group of Elements: Prof. J. Dewar, F.R.S.

LINNEAN SOCIETY, at 8.—On the Muscular Attachment of the Animal to its Shell in some Fossil Cephalopoda (Ammonoidea): G. C. Crick.—The Comparative Anatomy of certain Genera of Cycadaceæ: W. C. Worsdell.

CHEMICAL SOCIETY at 8.—Effect of the Mono-, Di-, and Tri-chloracetyl Groups on the Rotatory Power of Methylic, and Ethylic Glycerates and Tartrates: Percy Frankland, F.R.S., and Dr. Thomas Stewart Patterson.—The Rotation of Ethylic and Methylic Di-monochloracetyltartrates: Percy Frankland, F.R.S., and Dr. Andrew Turnbull.—The Volumetric Estimation of Sodium: H. J. H. Fenton.

FRIDAY, FEBRUARY 4.

ROYAL INSTITUTION, at 9.—Some New Studies in Kathode and Röntgen Radiations: A. A. Campbell Swinton.

GEOLOGISTS' ASSOCIATION, at 7.30.—Annual General Meeting.—Palæolithic Man: E. T. Newton, F.R.S., President.

SATURDAY, FEBRUARY 5.

ROYAL INSTITUTION, at 3.—Cyprus: Prof. P. Geddes.

MONDAY, FEBRUARY 7.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Curing of Malt in relation to Colour and Value: J. W. Lovibond.—Clerget's Method of Estimating Cane Sugar: A. R. Ling.—A New Modification of Clerget's Method of Estimating Cane Sugar, specially applicable to Molasses and After Products: A. R. Ling and J. T. Baker.—Note on the Estimation of Water in Invert Sugars: Dr. L. T. Thorne and E. H. Jeffers.

TUESDAY, FEBRUARY 8.

ROYAL INSTITUTION, at 3.—The Simplest Living Things: Prof. E. Ray Lankester, F.R.S.

ROYAL HORTICULTURAL SOCIETY, at 3.—Annual General Meeting.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Security of Locomotive Fire-Boxes: William Thow.—Friction of Locomotive Slide-Valves: John A. F. Aspinall.

ROYAL VICTORIA HALL, at 8.30.—The Problem of the Great African Lakes: J. E. S. Moore.

WEDNESDAY, FEBRUARY 9.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Notes on the Electro-Chemical Treatment of Ores containing the Precious Metals: Major-General Webber, C.B.—An Electrolytic Process for the Manufacture of Parabolic Reflectors: Sherard Cowper-Coles.

SANITARY INSTITUTE, at 8.—Purification of Water for Barracks, Prisons, and other Institutions: Prof. J. Lane Notter.

THURSDAY, FEBRUARY 10.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Contributions to the Theory of Alternating Currents: W. G. Rhodes.—The Development and Morphology of the Vascular System in Mammals. I. The Posterior End of the Aorta and the Iliac Arteries: Prof. A. H. Young and Dr. A. Robinson.—Further Observations upon the Comparative Chemistry of the Suprarenal Capsules: B. Moore and Swale Vincent.

MATHEMATICAL SOCIETY, at 8.—The Transformations which leave the Length of Arcs on any Surface Unaltered: J. E. Campbell.—On Aurifeuillians: Lieut.-Colonel Cunningham, R.E.

INSTITUTION OF MECHANICAL ENGINEERS, at 7.30.—Report of the Council.—Discussion upon Mr. Philip Dawson's Paper on Mechanical Features of Electric Traction.

FRIDAY, FEBRUARY 11.

ROYAL INSTITUTION, at 9.—The Metals used by the Great Nations of Antiquity: Dr. J. H. Gladstone, F.R.S.

ROYAL ASTRONOMICAL SOCIETY, at 3.—Annual General Meeting.

PHYSICAL SOCIETY, at 5.—Annual General Meeting.—Address by the President.—Also Paper: On Electromagnetic Induction in Plane, Cylindrical, and Spherical Current Sheets, and its Representation by Moving Trails of Images: Prof. G. H. Bryan, F.R.S.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Protection of Power Transmissions from Lightning: John T. Morris.

INSTITUTION OF MECHANICAL ENGINEERS, at 7.30.—First Report to the Gas-Engine Research Committee: Description of Apparatus and Methods, and Preliminary Results: Prof. Frederic W. Burstall.—Steam Laundry Machinery: Sidney Tebbutt.

MALACOLOGICAL SOCIETY, at 8.

BOOKS, PAMPHLET, and SERIALS RECEIVED.

BOOKS.—Introduction to Chemical Methods of Clinical Diagnosis: Dr. H. Tappeiner, translated by Dr. E. J. McWeeney (Longmans).—Annuaire de l'Observatoire Royal de Belgique, 1898 (Bruxelles).—Lehrbuch der Gesammten Wissenschaftlichen Genealogie: Dr. O. Lorenz (Berlin, Hertz).—A Text-Book of Zoology: Profs. Parker and Haswell, 2 Vols. (Macmillan).—Mensuration, Hydrostatics, and Heat: G. H. Wyatt (Rivingtons).—Chemical Experiments: G. H. Wyatt (Rivingtons).—The Mathematical Theory of the Top: Prof. F. Klein (New York, Scribner).—Glass-Blowing and Working: T. Bolas (Dawbarn).—Report of the Commissioner of Education for the Year 1895–96, Vol. 2 (Washington)—Lose Blätter aus Indien, ii. (Batavia, Albrecht).—Arbeiten des Physikalischen-Chemischen Instituts der Universität Leipzig aus der Jahren 1887 bis 1896, Bd. 1 to 4, Herausgegeben von W. Ostwald (Leipzig, Engelmann).—Explosifs Nitrés: J. Daniel (Paris, Gauthier-Villars).—Observations and Researches made at the Hong Kong Observatory in the Year 1896: W. Doberck (Hong Kong).

PAMPHLET.—Old Age Pensions: W. Birkmyre (Glasgow, Aird).

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CONTENTS. PAGE