suffered great damage by the earthquake on April 18. A massive gateway of stone at the main entrance to the University grounds is now a ruin, and the great dragons which surmounted it lie broken to pieces on the ground. An immense memorial arch has been wrecked, and a fine marble memorial to Henry Lathrop, Mrs. Stanford's brother, has been demolished. The museum has been seriously damaged, the whole roof of the art gallery having fallen in, and part of the roof of the other wing. The entire centre of the building devoted to the department of chemistry is a wreck. The gymnasium, just completed and never used, is an absolute ruin, and another large new building, the library, also just completed and about to be dedicated, is in the same condition. The building devoted to zoology and physiology is not much damaged. The president of the University, Dr. D. S. Jordan, who was at home at the time of the earthquake, believes that the shock of April 18 was not only one of the severest, but also one of the longest duration on record. The *Times* correspondent learns also that the narrow-gauge railway to Santa Cruz has been so badly damaged that it will be months before trains can again be run. There are many tunnels on this line, and in various instances these tunnels, which formerly were straight lines, are now corkscrew-shaped. At San Jose a flower garden was turned into a lake of mud from which a dozen geysers burst into activity after the earthquake.

THE current number of the *University Review* contains an inspiring article on "Science and the Public" by Major Ronald Ross, F.R.S., professor of tropical medicine in the University of Liverpool. Insistence is laid on the fact that science is almost exclusively the work of individuals, and that, though willing enough to benefit by the discoveries and inventions of men of science, the public is in no sense imbued with the scientific spirit. Instead of cultivating the absolutely impartial judgment demanded by science, the public encourages the habit of mind eulogised by Tennyson, "believing where we cannot prove," and forgets there is nothing meritorious in such conduct, but much that is the reverse. The essay proceeds to show that to this willingness to ignore science and scientific methods may be traced the credulity of the public which leads it to subsidise quack medicine, to ignore beneficent discoveries like that of Jenner, to hamper scientific research by unintelligent anti-vivisection societies, and generally to proclaim its adherence to the policy of "muddling through." An instance is given by Major Ross from his own experience which shows how slightly as yet the mass of mankind has been influenced by scientific methods. More than seven years ago it was demonstrated that malaria is conveyed from man to man by a group of gnats, and several obvious and practicable modes of prevention were suggested in consequence of the discovery. But when these measures were urged upon the public and governments of our tropical colonies, the so-called educated white people scoffed at the whole discovery, without troubling to ascertain the facts, and the governments, with the exception of a few, took no action which could for a moment be called adequate. The magnitude of the offence may be gathered when it is remembered that half the people in the tropics suffer from the disease every year; but in view of recent events it is easy to see that the world will be dominated eventually more and more by the disciplined and scientific peoples, and those nations which reject science will be set aside.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 25.—"An Electrical Measuring Machine." By Dr. P. E. **Shaw.** Communicated by Prof. J. H. Poynting, F.R.S.

The principle of the measuring machines in general use is that one face of the gauge rests against one jaw, fixed, of the machine, whilst the other jaw is moved forward by a screw until it touches the other face. These machines may be called mechanical-touch machines in contradistinction to the new machine called the electric-touch machine. This depends on the same general principle as the electric micrometer used by the author in several researches.

Objections to the mechanical-touch methods are:—(1) they involve strain in the machine of a much larger order than in the electric method; (2) they are less sensitive; (3) it is impossible to measure between point and point. To measure between points or rounded points is essential in accurate metrology, especially for gauges with flat ends; for when each jaw has a flat face and each end of the gauge has also a flat face, each of these four faces having errors in planeness and parallelism, the resulting measurements must be erroneous. If, however, measurement be taken between small spheres on the screw ends, no assumptions as to planeness and parallelism are made, and such errors vanish from the results.

The electric measuring machine consists of (*a*) two headstocks containing micrometer screws; (*b*) a table to carry the gauge; (*c*) a massive slide bed, on which run the headstocks and table. The gauge to be measured is clamped on the table, and is set true with respect to the micrometer screws by two rotations and two translations provided in the table. This adjustment is made by special electric-touch methods devised for the purpose. To make a measurement of the gauge the left screw is brought into electric contact (indicated by a telephone) with the gauge; then the right screw is brought into electric touch with it, and when current passes through from one measuring point to the other the two divided heads on the micrometer screws are read. To turn the graduated head the screw system is not actually touched by the hand, but is worked by an outside hand-pulley and string.

Special care is taken in the design of the machine to avoid periodical screw error and backlash.

A careful calibration by wave-lengths of several millimetres of the screws shows where they are specially uniform, and therefore fit for use.

Results are obtained for all kinds of gauges. For bar gauges with flat ends, measurements taken at many places reveal considerable variation in thickness, so that irregular contour curves, roughly centred in the centre of the gauge faces, can be drawn showing that the ends are far from being plane or parallel. These errors in bar gauges have not been previously pointed out or measured. The author contends that all bar gauges should be measured by this method and the errors registered, so that, even if the errors are not corrected, by re-scraping or otherwise, they will be known and allowed for.

Cylindrical and spherical gauges are also tested; these are shown to be much more nearly perfect than bar gauges.

A further use of the machine is in the measurement of non-conducting bodies, such as glass plates, the thickness of which can be measured with great accuracy.

Readings are taken with ease and certainty to 1/250,000th of an inch, and one-quarter of this can be obtained if specially desired.

March 1.—"An Experimental Inquiry into the Factors which determine the Growth and Activity of the Mammary Glands." By Miss J. E. **Lane-Claypon**, D.Sc., and Prof. E. H. **Starling**, F.R.S.

So far as the authors' experiments go, they show that the growth of the mammary glands during pregnancy is due to the action of a specific chemical stimulus produced in the fertilised ovum. The amount of this substance increases with the growth of the fœtus, and is therefore largest during the latter half of pregnancy. Lactation is due to the removal of this substance, which must therefore be regarded as exerting an inhibitory influence on the gland cells, hindering their secretory activity and furthering their growth. It is probable that the specific substance is diffusible, and will withstand the boiling temperature.

The authors do not, however, claim that these conclusions are firmly established. A final decision can only be given by a research carried on under more favourable conditions. In fact, a farm is required where the authors could have at their disposal 500 rabbits, and could arrange for a plentiful supply each day of rabbits about the middle of pregnancy.

Zoological Society, April 10.—Mr. H. Druce, vice-president, in the chair.—The fresh-water fishes of the island of Trinidad: C. Tate **Regan.** The author's remarks were chiefly based on a collection made by Mr. Lechmere Guppy, jun., and presented by him to the British Museum.

The collection was accompanied by natural history notes and by a series of beautifully executed water-colour drawings. Forty species of fresh-water fishes were now known from the island; these were enumerated in the paper, and four of them described as new to science.—The collection of Alcyonarians made by Mr. Cyril Crossland at Zanzibar in 1901–2: Prof. J. A. **Thomson** and W. D. **Henderson.** Specimens of sixty-five species or varieties were contained in the collection, of which twenty-seven were described as new.—Cyclopia in osseous fishes, as observed in several advanced trout embryos: Dr. J. F. **Gemmill.** A detailed account of the anatomy of the specimens was given, and a comparison made with Cyclopia in mammals. The author's views were also put forward regarding the mode of origin of this condition in fishes.—Cases of supernumerary eyes, and local deficiency and re-duplication of the notochord, in trout embryos: Dr. **Gemmill.**—Descriptions of three new varieties of butterflies of the genus Heliconius: P. I. **Lathy.**

Faraday Society, April 10.—Prof. A. K. Huntington in the chair.—Electrothermics of iron and steel: C. A. **Keller.** The author deals with the present position of his processes; he describes the electrical steel plant which Messrs. J. Holtzer and Co. have just installed in their works at Unieux (Loire). This is a 1500 h.p. plant, and will utilise in a single furnace the current from a 20,000-ampere Westinghouse alternator. The furnace, which rests on a steel cradle and can be tilted, weighs about 50,000 kilos.; the various mechanical and electrical controls are obtained by hydraulic motors. The steel obtained from a Siemens-Martin furnace will be run into the electric furnace immediately after the oxidising melt, and for the remaining operations of deoxidising and refining the current exclusively will be used.—Note on the rotating electric steel furnace in the Artillery Construction Works, Turin: Ernesto **Stassano.** The furnace described and illustrated in the paper is being installed by the "Forni Termoelettrici Stassano" Company for the Italian War Office. It is of the author's well-known arc type, and absorbs 140 kilowatts, yielding 2400 kilos. of steel in twenty-four hours. The current is a rotary one with 80 volts between each phase. The consumption of electrodes is less than 5 kilos. per ton of steel, and the cost of renewing the refractory covering of the furnace 10 francs per ton of metal made. The furnace is principally used for refining pig-iron and smelting scrap. The product ordinarily made is used for artillery projectiles.—Note on recent developments in the Gin electric steel furnace: Gustave **Gin.** The author's canal-type of furnace is now installed at the Plettenberg Works, Westphalia, of which illustrations are given in the paper, but it is not stated which particular type of furnace has there been experimented with. The following types are described:—(1) furnace with canals and chambers; (2) combination furnace; (3) induction furnace.—Notes on the cleaning of work by means of the electric current: H. S. **Coleman.** The work to be cleaned (usually preparatory to electro-plating) is suspended in a hot solution of equal quantities of brown Montreal potash and sodium hydrate contained in a wrought-iron tank. The work and the tank are connected to a dynamo, and the tank used as the anode for five to ten minutes, the voltage being about 2·5. The current is then reversed for a short time, until the surface of the work is clear and bright. The operation is repeated as many times as may be necessary.

Royal Meteorological Society, April 18.—Mr. R. Bentley, president, in the chair.—Some so-called vagaries of lightning reproduced experimentally: A. **Hands.** The author, in the course of an extended investigation into the effects of lightning, has come across many cases that have been called vagaries, but which on a close inspection have proved to be extraordinary only in the erroneous way in which they were described, and, had they been correctly reported, would have appeared perfectly consistent with preconceived ideas—in fact, could have been foretold in every case if the conditions that led to those effects had been known before the events occurred. The author reproduced experimentally several so-called vagaries of lightning, showing by means of rough models the conditions under which they occurred.—The value of a projected image of the sun for meteorological study: Miss C. O. **Stevens.** By this method it has been ascertained that where the direction of movement of the atmosphere is tangential to the limb of the sun, the phenomenon of "boiling" displays a coursing or rippling character, and that where it is perpendicular to the limb of the sun, the character of the movements of distortion is that of springing in and out of the area of the sun's image. Both these elements of movement are continuous even in the absence of all visible cloud, and it is possible, not only to detect, but also to distinguish between overlying invisible atmospheric strata.

Mathematical Society, April 26.—Prof. A. R. Forsyth, president, and subsequently Prof. W. Burnside, vice-president, in the chair.—Perpetuants and contra-perpetuants: Prof. E. B. **Elliott.** It is proposed to apply a method, based on the use of symmetric functions and of certain differential operators, to the discovery of complete systems of perpetuants of given partial degrees in assigned sets of coefficients, which shall be equivalent in their aggregate to those which have been arrived at by the systematic examination of symbolic products. Contra-perpetuants are introduced in connection with Hermite's doctrine of reciprocity between degree and extent in systems of seminvariants when this doctrine is correlated with the theory of perpetuants.—A set of intervals about the rational numbers: A. R. **Richardson.** A definite construction is given for associating a set of intervals with the rational numbers, in such a way that all the rational numbers are included in the intervals, and certain definite sets of irrational numbers are excluded from all the intervals.—Some theorems connected with Abel's theorem on the continuity of power series: G. H. **Hardy.** The paper deals with the generalisation, for series of which the terms are continuous functions of a variable, of certain well-known theorems relating to power series. The convergence of Σa_n is sufficient to secure the uniform convergence of $\Sigma a_n f_n(x)$ in an interval in which all the functions $f_n(x)$ are continuous, and these functions diminish in value as n increases; a similar theorem holds also if Σa_n diverges, but is of the type which can be summed by averages.—The canonical forms of the ternary sextic and quaternary quartic: Prof. A. C. **Dixon.** The forms are the sums of ten sixth, or fourth, powers, as the case may be. Processes are given for carrying out the reductions to these forms, and it is shown that in each case there are two solutions.—The accuracy of interpolation by finite differences: W. F. **Sheppard.** The paper deals with the relative accuracy of the ordinary advancing-difference formula and the central-difference formulæ in regard to the two sources of error which arise (1) from omitting the remainder in the series by which the values of a function are calculated, (2) from the fact that tabulated values of a function are only approximate.—The geometrical interpretation of apolar binary forms: C. F. **Russell.** The paper is concerned with geometrical constructions which may be regarded as generalisations of the construction of the fourth harmonic point of three given points in a definite order. For two apolar forms of the same order, analogous to two quadratic forms harmonically related, the construction is linear.—Two cubic curves in triangular relation: Prof. F. **Morley.**—The question of the existence of transfinite numbers: P. E. B. **Jourdain.**—A question in the theory of aggregates: Prof. A. C. **Dixon.**

PARIS.

Academy of Sciences, April 17.—M. H. Poincaré in the chair.—The president announced the death of Prof. Langley, correspondant of the academy.—The evaluation of the foco-facial distances of microscopic objectives: L. **Malassez.** A comparison of two experimental methods with the results of a formula developed by the author in previous papers.—Pure ferro-molybdenums: contribution to the study of their constituents: Em. **Vigouroux.** Alloys of iron and molybdenum containing varying proportions of the two constituents were submitted to treatment either with dilute hydrochloric acid or an acid solution of cuprous chloride. The insoluble residues from fourteen separate alloys were analysed, and the following four compounds of iron and molybdenum isolated in a pure state:—Fe_2Mo, Fe_3Mo_2, FeMo, $FeMo_2$. The physical and chemical proper-

ties of each of these are given.—A characteristic reaction of ethyl glyoxylate: the action of ammonia on this ether and its derivatives: L. J. **Simon** and G. **Chavanne.** By the action of ammonia on ethyl glyoxylate a substance $C_4H_9N_3O_4$ is formed. This is blue-black in colour, and possesses very powerful tinctorial properties, and hence may form a useful test for this ester. The composition of this substance has not yet been established.—The acid properties of starch: E. **Demoussy.** Starch possesses all the characters of a feeble acid, comparable with carbonic acid, and resembling in this respect the other carbohydrates. It forms compounds with metallic hydroxides which are dissociable by water, and can absorb small quantities of neutral salts. These properties probably play a part in the absorption of mineral matters by plants.—The state of colouring matters in crystals coloured artificially: P. **Gaubert.** It has been shown in previous papers that there are two cases in the artificial colouring of crystals; in the first case the crystal is only coloured when the solution from which the crystal is depositing is nearly saturated with the colouring material; in the other case the crystal is coloured, whatever the dilution of the colouring material. The present paper gives details of measurements made on crystals of the latter class, phthalic acid, with methylene blue in solution. It was found that the ratio of the concentrations of the methylene blue in the liquid and crystals was practically constant, although the absolute concentration of the methylene blue was made to vary within wide limits. Similar results were found with methylene blue and crystals of urea nitrate.—The Vesuvian origin of the dry storm observed at Paris on the morning of April 11: Stanislas **Meunier.** A microscopical examination of the dust deposited during this storm showed it to be identical in nature with the dust from Vesuvius in 1822.

DIARY OF SOCIETIES.

THURSDAY, MAY 3.

ROYAL SOCIETY, at 4.—Election of Fellows.—At 4.30.—On a Static Method of Comparing the Densities of Gases: R. Threlfall, F.R.S.—The Stability of Submarines: Sir William H. White, K.C.B., F.R.S.—The Action on Bacteria of Electrical Discharges of High Potential and Rapid Frequency: A. G. R. Foulerton and A. M. Kellas.—The Action of Pituitary Extracts upon the Kidney: Prof. E. A. Schäfer, F.R.S., and P. T. Herring.

ROYAL INSTITUTION, at 5.—The Digestive Tract in Birds and Mammals: Dr. P. Chalmers Mitchell.

CHEMICAL SOCIETY, at 8.30.—The Relation between Absorption-Spectra and Chemical Constitution, part v.: The *iso*Nitroso-compounds: E. C. C. Baly, E. G. Marsden, and A. W. Stewart.—The Action of Tribromopropane on the Sodium Derivative of Ethyl Malonate, part ii.: W. H. Perkin, jun., and J. L. Simonsen.—Brazilin and Hæmatoxylin, part vii., Some Derivatives of Brazilein: P. Engels, and W. H. Perkin, jun.—Pipitzahoic Acid: J. M. Sanders.—The Constitution of the Hydroxides and Cyanides obtained from Acridine, Methyl-acridine and Phenanthridine Methiodides: C. K. Tinkler.—The Constitution of Ammonium Amalgam: E. M. Rich and M. W. Travers.—Action of Light on Potassium Ferrocyanide: G. W. A. Foster.

LINNEAN SOCIETY, at 8.—Origin of Gymnosperms (*Continuation of Discussion*): Dr. D. H. Scott, F.R.S.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Some Observations on Bacterial Tank Operations: Dr. W. O. Travis.

FRIDAY, May 4.

ROYAL INSTITUTION, at 9.—The Steam Turbine on Land and at Sea: Hon. Charles A. Parsons, C.B., F.R.S.

GEOLOGISTS' ASSOCIATION, at 8.—The Erosion of the Batoka Gorge of the Zambesi: G. W. Lamplugh, F.R.S.

MONDAY, MAY 7.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—From the Victoria Nyanza to Kilimanjaro: Col. G. E. Smith, R.E.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Some Notes on the Gutzeit Test for Arsenic: J. Goode and Dr. F. Mollwo Perkin.—The Separation of Brucine and Strychnine. Influence of Nitrous Acid in Oxidation by Nitric Acid: W. C. Reynolds and R. Sutcliffe.—Absorption of Gallic Acid by Organic Colloids: W. P. Dreaper and A. Wilson.

VICTORIA INSTITUTE, at 4.30.—The Zodiac: its History and Biblical References: Rev. A. B. Grimaldi.

TUESDAY, MAY 8.

SOCIETY OF ARTS, at 8.—Damascening, and the Inlaying and Ornamenting of Metallic Surfaces: Sherard Cowper-Coles.

UNIVERSITY OF LONDON, at 5.—The Atmospheric Circulation and its Relation to Weather: Dr. W. N. Shaw, F.R.S.

ROYAL INSTITUTION, at 5.—Glands and their Products: Prof. W. Stirling.

WEDNESDAY, MAY 9.

SOCIETY OF ARTS, at 8.—Bridge Building by Means of Caissons, including Remarks upon Compressed Air Illness: Prof. Thomas Oliver.

GEOLOGICAL SOCIETY, at 8.—The Eruption of Vesuvius in April, 1906: Prof. Giuseppe de Lorenzo.—The Ordovician Rocks of Western Caermarthenshire: D. C. Evans.

THURSDAY, MAY 10.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* "Adsorption" and "Occlusion": the Law of Distribution in the Case in which one of the Phases possesses Rigidity: Prof. M. W. Travers, F.R.S.—Cyanogenesis in Plants, part iv., Phaseolunatin in Common Flax (*Linum usitatissimum*); part v., The Occurrence of Phaseolunatin in Cassava (*Manihot Aipi* and *Manihot Utilissima*): Prof. W. R. Dunstan, F.R.S., Drs. T. A. Henry, and S. J. M. Auld.—A Variety of Thorianite from Galle, Ceylon: Prof. W. R. Dunstan, F.R.S., and B. Mouat Jones.—The Mechanism of Carbon Assimilation in Green Plants: the Photolytic Decomposition of Carbon Dioxide *in vitro*: F. L. Usher and J. H. Priestley.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Long Flame Arc Lamps: L. Andrews (Adjourned Discussion).

FRIDAY, MAY 11.

ROYAL INSTITUTION, at 9.—Some Astronomical Consequences of the Pressure of Light: Prof. J. H. Poynting, F.R.S.

PHYSICAL SOCIETY, at 8.—The Effect of a Rapid Discharge on the Throw of a Galvanometer: A. Russell.—Exhibition of Lippmann Capillary Dynamo and Electromotor: Prof. H. A. Wilson.—Exhibition of an Apparatus for demonstrating the Movements of the Diaphragms of Telephonic Transmitters and Receivers and the Current flowing into and out of the Cable during Speech: W. Duddell.

ROYAL ASTRONOMICAL SOCIETY, at 5.

MALACOLOGICAL SOCIETY, at 8.—Notes on the Subgenus Malluvium: E. A. Smith, I.S.O.—Notes on some Species of the Genus Mitra, with the Description of *M. Brettinghami*, n.sp: E. A. Smith, I.S.O.—On some Land- and Fresh-water Mollusca from Sumatra, part ii.: Rev. R. Ashington Bullen.—Notes on a Collection of Nudibranchs from the Cape Verde Islands: C. Crossland and Sir Charles Eliot, K.C.M.G.—Notes on Indian and Ceylonese Species of Glessula: Col. R. H. Beddome.

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