meeting of the Society. Miss Scott attempts to show, "as a matter of purely pedagogic interest," how simply and naturally Cayley's theory follows from a small number of very elementary geometrical conceptions, without any appeal to analytical geometry.—Lines common to four linear complexes, is a short note, by Dr. V. Snyder, which was read at the February meeting.—The cubic resolvent of a binary quartic derived by invariant definition and process, by Prof. H. S. White, was read at the Chicago Conference (January 1, 1897).—Dr. Isabel Maddison reviews two recent works on geometry, viz. Phillip's and Fisher's "Elements of Geometry," and H. D. Thompson's "Elementary Solid Geometry and Mensuration," which she thinks rise above the general level. Dr. Maddison also points out that the map-colouring problem was discussed (before Cayley and De Morgan wrote upon it) by Möbius, in his lectures in 1840. The problem was propounded to Möbius by Prof. Weiske, and is to be found in the *Berichte der Sächsischen Gesellschaft der Wissenschaften zu Leipzig*, Math.-physiche Classe, Bd. 37, 1885. The Note referred to is by Prof. Baltzer, and its title is "Eine Erinnerung an Möbius und seinen freund Weiske."—The Notes contain the mathematical courses at the Universities of Berlin and Harvard.

THE last number of the *Journal of the Russian Chemical and Physical Society* contains, in an appendix, the third instalment of the "Record" (*Vremennik*) of the Russian Chief Board of Measures and Weights. Most of it is given to an elaborate paper, by Prof. Mendeléeff, on the "Methods of Accurate or Metrological Weighings." The formulæ relative to the oscillations of the scales' index, and to the "condition" of the scales, are discussed in great detail, and new formulæ are given; while the discussion of some of the results has brought the Russian professor to the discovery of a new property of the parabola relative to the surface of a segment of it (*Comptes rendus*, 1895, p. 1467).—The same issue contains papers on the quantity of carbon dioxide contained in the air of the Weighing Hall of the Board of Measures and Weights, by A. Dobrokhotoff; the results of the verification at the Standards Department of the Board of Trade, in 1894 and 1895, of the Avoirdupois Pound belonging to the Russian Government, and the comparison of the Russian half-sashen with the Imperial standard yard, by H. J. Chaney, Mendeléeff, and Blumbach (in English and Russian); on the geographical position of the Board of Measures (chiefly its exact altitude above the sea-level); and a note, by Prof. Mendeléeff, on the agreement of the author's well-known formula for the density of water at different temperatures with the last measurements of the same, by M. Thiesen.

Bollettino della Società Sismologica Italiana, vol. ii., 1896, N.N. 7, 8.—Influence of the different nature and sensitiveness of instruments on the measure of the velocity of seismic waves, by G. Agamennone.—On the geodynamic system of the world, by G. Grablovitz.—Summary of the principal eruptive phenomena in Sicily and the adjacent islands during the six months July–December 1896, by S. Arcidiacono.—Velocity of propagation of the earthquake of Ahmed (Asia Minor) of April 16, 1896 (in French), by G. Agamennone.—Vesuvian notes for the year 1896, by G. Mercalli.—Notices of earthquakes recorded in Italy, August 31–September 8, 1896; the most important being a series of records of the Iceland earthquake of September 6.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 8.—"Further Note on the Sensory Nerves of Muscles." By C. S. Sherrington, M.A., M.D., F.R.S., Holt Professor of Physiology in University College, Liverpool. Received February 26.

I was somewhat surprised when, after the sensory nature of the structures originally termed muscle-spindles (Kühne) had been proved (Sherrington), I was unable to find in the eye-muscles any examples of these structures. I had expected to find in those muscles, on account of the great delicacy of their control and coordination, and in view of the well-known richness of their innervation, a field peculiarly favourable for the examination and study of "spindles."

I had noted that the intrafusal muscle-fibres, of the "red" variety as they are, undergo, when the nerve-trunk of a muscle has been severed, a much slower course of alteration than do extra-fusal muscle fibres, *i.e.* I found no pronounced degeneration for even two years following section. I therefore cut through *n. oculomotorius* at its origin, and examined the resultant degenerations in the eye-muscles which it innervates and in their individual nerve-trunks.

In the nerve-trunks, extra-muscular and intra-muscular, the Wallerian degeneration clearly demonstrated that, with the exception of a few minute fibres, of variable number, derived perhaps from the ciliary ganglion, *all* myelinate nerve-fibres in all these eye-muscles degenerate. Therefore these eye-muscles derive the vast majority of their myelinate nerve-fibres from *n. oculomotorius*. The sensory innervation of these muscles is not, therefore, derivable from the fifth cranial pair. In accord with this, I found (α) that severance of both trigemini caused no obvious impairment of the movement of the eye-balls, (β) that the combined severance of both *nn. trigemini*, and of both optic nerves, even after section of the encephalic bulb, did not severely depress the tonus of the eye-muscles. Now we know that section of the sensory spinal roots belonging to muscles does very severely depress the tonus of them.

At the same time, I was struck with the long distance to which many of the nerve-fibres in these muscles travel forward towards the ocular tendons of the muscles. I was the more impressed with this fact because direct examination proved that the regions of the distribution of motor end-plates in these muscles is almost confined to the middle portion of the fleshy mass of the muscle. Further investigation of the course and destination of the nerve-fibres at the tendon end of the muscle revealed them (both in cat and monkey) undergoing terminal subdivision, and in numerous instances passing beyond into the bundles of the tendon itself. The terminations of some of these nerve-fibres lie within the tendons; many recurve again towards the muscular fibres, and end just at junction of muscle-fibre with tendon-bundle. The nerve-fibres in so terminating frequently become thick—as I have described in the case of muscle-spindles—with shortened internodes.

My observations have included also the fourth cranial pair, and with like result. Investigation of the sixth cranial pair is also in progress.

It also appears from the above that the absence of the distinct Kühne-Ruffini "spindles" from a muscle does not exclude the possession by it of sensorial end-organs, and of afferent nerve-fibres. This point is not without importance, because examination of various muscles has led me to the conclusion that the "spindle-organs" are absent from the following muscles:—From all the orbital eye-muscles; from the intrinsic muscles of the larynx, though Pacinian corpuscles occur, as in various other muscles; from the intrinsic muscles of the tongue, and from the diaphragm. It is notable that all these muscles belong to that set which are innervated by nerve-fibres of rather smaller calibre (Gaskell) than those supplying the skeletal muscles generally; that is to say, are innervated by the non-ganglionated splanchnic efferent nerves of Gaskell.

"On Boomerangs." By G. T. Walker, M.A., B.Sc., Fellow of Trinity College, Cambridge. Communicated by Prof. J. J. Thomson, F.R.S. Received March 15.

A typical returning boomerang resembles in general outline a symmetrical arc of a hyperbola, and is about 80 cm. in length measured along the curve. At the centre, where the dimensions of the cross section are greatest, the width is about 7 cm., and the thickness 1 cm.

Of the two faces, one is distinctly more rounded than the other; in addition the arms are twisted through about 4°, in the same manner as the blades of a right-handed screw propeller.

Such an implement, if thrown with its plane vertical, will describe a circular path of 40 or 50 metres in diameter, rising to a height of from 7 to 12 metres, and falling to the ground with its plane of rotation horizontal at a point somewhere near the thrower's feet.

The flight may be regarded as a case of steady motion, of which the circumstances gradually vary. In the more complicated, as well as the simpler, paths, observation makes it clear that everything depends on the changes in direction and inclination of the plane of the boomerang, and that the character of these changes is always the same; if they can be explained theoretically, the peculiarities of the motion may be accounted for.

Since the effects of the different forces at work are conflicting, it is necessary to adopt quantitative methods, even if the degree of accuracy attainable is not high; accordingly ratios

comparable with a tenth are treated as small, and their squares neglected.

If we regard the boomerang as a thin, slightly distorted lamina, and integrate over it the forces indicated in S. P. Langley's paper on "Experiments in Aerodynamics" ("Smithsonian Contributions to Knowledge," 1891), we can obtain equations of motion. From these, treating the motion as steady (to the first approximation), we may deduce the values of the angular velocities on which the direction of the axis of rotation depends. Five cases are worked out numerically, and the various effects of the "rounding" and "twisting" agree in character with the experimental facts; the discrepancies in actual magnitude are not larger than might, from the nature of the case, have been anticipated.

The theoretical results may be further tested by applying them to determine the conditions favourable to the production of other flights in which, after the first circle, a loop is described, either in front of or behind the thrower; in each of these cases success has been attained. An explanation is also afforded of the returning of a boomerang without "twist," made by Mr. O. Eckenstein, and of the wonderfully long, straight trajectories of some of the native non-returning implements.

Geological Society, April 28.—Dr. Henry Hicks, F.R.S., President, in the chair.—The President, referring to the exhibit of models of the dorsal and ventral aspect of *Triarthrus*, said that these had been prepared and sent to him by Mr. Charles E. Beecher, of Yale University Museum. He was sure that they would prove of great interest to the Fellows, who were well acquainted with the extremely careful work which Mr. Beecher had done in connection with *Triarthrus*.—The following communications were read:—Note on a portion of the Nubian Desert south-east of Korosko, by Captain H. G. Lyons, R.E., with notes on the petrology by Miss C. A. Raisin, and water-analyses by Miss E. Aston. A general description of the physical structure of the area, which consists mainly of Nubian sandstone and crystalline rocks, was given. Coming from Korosko to the Murrat Wells, the crystalline rocks are first met with on the east side of Jebel Raft. At Wadi dur Nabadi are ancient gold-workings. The crystalline rocks are both massive and schistose. On the crystalline mass of Jebel Raft, and apparently overlain by the Nubian sandstone, is a very coarse conglomerate containing fragments of crystalline rock, which appears to be older than the Nubian sandstone. The Nubian sandstone has little or no dip, and shows very slight variation in composition. The water-supply of the Nubian Desert is directly dependent on the rainfall, which is very irregular. The wells are sunk in the detritus of the valleys, and contain a large amount of mineral matter in solution, which renders them almost undrinkable; while the second source of supply—the rain-water reservoirs—are deep holes in the ravines which intersect the crystalline hills. These holes are attributed to water-action; and in the reservoir of Medina in Jebel Raft the spherical stones which assisted in forming the pothole still occur. The author believed that these ravines and reservoirs were formed at an earlier period than the present, when the rainfall was heavier. Miss Raisin gave accounts of both massive and schistose crystalline rocks, and also of sedimentary rocks. The crystalline rocks described include gneiss, hornblendite, gabbro, often much altered and resembling some of the Alpine gabbros, some allied rocks containing lustre-mottled hornblende, other forms of diabase, quartz-diorite, granite, felsites, certain schistose and a few distinctly fragmental rocks. None of the igneous rocks could be stated with certainty to have originated as a lava-flow. Many of them had undergone much alteration since their consolidation, and the results of this were described. There was clear evidence in many cases of erosion by desert-sand and the formation of a weathered coating. The schistose rocks did not present a very modern facies, and might be late Archæan or early Palæozoic. The massive crystallines may belong to different epochs, but include some rocks (such as the gneiss) resembling Archæan. These seemed to mark an eastward extension of the anticlinal axis previously traced by Captain Lyons to Wady Halfa in the Nile Valley from the west. Miss Aston gave two tables, one of which showed the actual amounts of substances found in the wells of Murrat, Bir Tilat Abda, and Bir Ab Anaga, while the second showed their approximate constitution.—On the origin of some of the gneisses of Anglesey, by Dr. Charles Callaway. The author still maintained the occurrence of two pre-Cambrian groups in Anglesey, the later of Pebidian age. In his paper a description was given of the production of gneissic structure in rocks of the earlier group occurring in the south of the island. The products of metamorphism were similar to those described by the author in the Malvern area. (1) Simple schists, granite is converted into mica-gneiss, diorite into hornblendic or chloritic gneiss, and felsite into mica-schist; (2) Injection-schists.

Zoological Society, May 4.—Mr. Herbert Druce, in the chair.—Mr. Oldfield Thomas exhibited a selection of the Mammals recently collected by Mr. A. Whyte during his expedition to the Nyika plateau and the Masuku mountains, North Nyasa. Mr. Thomas described as new a squirrel (*Xerus lucifer*), brilliant rufous throughout, with a black dorsal patch; a reed-rat (*Thryonomys sclateri*), allied to *T. gregorianus*, but with a longer tail, whitish instead of yellowish underside, and narrower and differently shaped skull; a mole-rat (*Georychus whytei*), like *G. nimrodi*, but with longer and broader frontal premaxillary processes; a pouched mouse (*Saccostomus elegans*), of a general buff colour and with a longer head than *S. campestris*; and *Mus nyikæ*, a rat of the size of *Mus chrysophilus*, but darker in colour and with a more rounded skull. A new subgeneric term (*Gerbilliscus*) was suggested for *Gerbillus boehmi*, Noack, of which Mr. Whyte had sent home specimens. Mr. Thomas also stated that the peculiar bulbous-tipped tail hairs described in *Petrodromus* proved to be confined to and characteristic of East African examples of the genus, which might therefore be specifically separated from the Zambezi forms as *P. sultani*.—Mr. Howard Saunders exhibited, on behalf of Mr. Henry Evans, a series of instantaneous photographs of the great grey seal (*Halichœrus gryphus*) which had been taken in the Outer Hebrides.—Mr. J. E. S. Moore gave a general account, illustrated with the optical lantern, of the zoological results of his expedition to Lake Tanganyika in 1895 and 1896. Mr. Moore stated that the main object of the expedition had been to obtain materials for the morphological study of certain hitherto uninvestigated animal forms. It appeared that a key to the general interpretation of the lake-faunas of Central Africa would be most readily obtained by a study of their Molluscan Types. These showed that the faunas of most of the vast inland reservoirs of Africa were composed of normal lacustrine stocks, but that in Lake Tanganyika there were strange forms which certainly could not be included among such groups. All these forms appeared to have marine affinities; but, as they could not be directly associated with any living oceanic species, it was argued that they were probably the survivors of the marine fauna of some more ancient times, when Tanganyika was connected with the ocean. This theory was supported by the similarity of certain Tanganyika gastropods to ancient fossil shells.—A communication was read from Mr. Walter E. Collinge, on some European slugs of the genus *Arion*.—Mr. Sclater read a communication from Mr. Frederick J. Jackson, containing field-notes on the antelopes of Mau District, British East Africa.—The Rev. H. S. Gorham contributed a paper on the Coleoptera of the family *Endomychidæ* of the Eastern Hemisphere. Eighteen species were described, of which eleven were characterised as new.—Mr. F. E. Beddard, F.R.S., read a note upon the presence of intercentra in the vertebral column of birds. The existence of free intercentra in the caudal region was described in a number of genera belonging to many families of birds.

MANCHESTER.

Literary and Philosophical Society, April 27.—Dr. E. Schunck, F.R.S., President, in the chair.—Sir Henry E. Roscoe, F.R.S., was elected an honorary member. The following were elected officers and members of the Council for the ensuing year:—President, J. Cosmo Melvill; Vice-Presidents, Prof. O. Reynolds, F.R.S., Prof. A. Schuster, F.R.S., Charles Bailey, and W. H Johnson; Secretaries, R. F. Gwyther and Francis Jones; Treasurer, J. J. Ashworth; Librarian, W. E. Hoyle; other members of the Council, Prof. H. B. Dixon, F.R.S., Prof. H. Lamb, F.R.S., Dr. A. Hodgkinson, Francis Nicholson, J. E. King, and R. L. Taylor.—On the composition of some ancient Egyptian bronze and iron implements, by Dr. A. Harden. The author communicated the results of the analysis of two ancient iron chisels found in Thebes, and dating from about 600 B.C. Both of the implements contain a very small amount of carbon, and could not be rendered very hard by tempering. A specimen of bronze, dating from about 1500 B.C., was found to resemble modern bronze in its composition, consisting of copper alloyed with tin.

PARIS.

Academy of Sciences, May 3.—M. A. Chatin in the chair.—New classification of the Phanerogams, based upon the ovule and the seed, by M. Ph. van Tieghem. A summary of the preceding papers on this subject.—Researches on the composition of wheat, and on its analysis, by M. Aimé Gerard. During the process of milling, some 30 per cent. of the wheat is not included in the flour. The composition of this residue is given for samples of wheat of different origin, stress being laid upon the importance of suitable mechanical treatment preceding the chemical analysis.—The morphological signification of the caudal vertebræ, by M. Armand Sabatier.—Remarks by M. Faye on the presentation of the sixth volume of the "Annales de l'Observatoire de Nice."—Remarks by M. Darboux on the inauguration of the monument to M. Lobatschevsky at Kazan.—The Committees of Judges were appointed for the Grand Prize of the Physical Sciences, and for the Bordin, Damoiseau, Fourneyron, Pourat, and Gay Prizes.—On the law of variations of latitude, by M. F. Gonnessiat. Results of experiments undertaken with a view of seeing whether the meridian circle, at the same time that it furnished the absolute positions of the stars observed, could not also serve to show the variations of latitude with as much certainty as the differential methods hitherto adopted.—On the problem of Dirichlet, by M. S. Zaremba. An application to this problem of the notation of the theory of electricity.—On the comparative accuracy of the various methods used in securing the vertical in astronomical, geodesic, and topographical observations, by M. Ch. Lallemand. Four methods of levelling were compared—the use of a mercury bath as a plane mirror, the plumb-line, the spirit-level, and the contact of three points with a mercury bath, the last-named having been lately suggested as more rapid and more accurate. As a result of the experiments, supposing in each case the most favourable conditions, the spirit-level was found to be preferable, its accuracy being, in a portable apparatus, about fifteen times that of any of the other methods.—New properties of the kathode rays revealing their complex composition, by M. H. Deslandres. Whenever a kathode ray is deviated by a neighbouring body, it is, at the same time, divided into several distinct rays, which are unequally deviated.—On the partial polarisation of the radiations emitted by some luminous sources under the influence of the magnetic field, by MM. N. Egoroff and N. Georgiewsky. The polarisation in the case of most of the metals employed was shown exclusively in the rays most easily reversed. This was especially marked with copper. The rays from hydrogen and helium have, up to the present, given no definite results.—The part played by peroxides in the phenomena of slow oxidation, by M. A. Bach. In all the cases of slow oxidation by the air examined by the author, the application of reagents for hydrogen peroxide showed that this substance is invariably present. The results of experiments on the oxidising substance produced by the action of air upon palladium charged with hydrogen showed that in this case a higher oxidising power upon indigo than is possible for hydrogen peroxide, and it is suggested that a higher oxide, possibly H_2O_4, is present.—Study of the action of potassium permanganate upon cupric bromide, by MM. H. Baubigny and P. Rivals.—On the constitution of the metallic alloys, by M. Georges Charpy. From the study of a large number of alloys by the micrographical method conclusions are drawn concerning the nature of alloys in general. Eutectic alloys are stated to be not really homogeneous, but to consist of a mixture of the two constituent metals in the form of excessively thin laminæ, which are only visible under very high magnification.—Estimation of the dissolved oxygen in sea water, by MM. Albert Lévy and Félix Marboutin. The method previously adopted with success for ordinary potable water, namely, addition of ferrous oxide in known excess, and subsequent estimation of the excess with potassium permanganate solution, does not give good results in the presence of chlorides, and hence fails for sea water. The replacement of the permanganate by bichromate solution, however, removes this difficulty, the test analyses given being very concordant.—On the combinations of metallic salts with organic bases, by M. D. Tombeck. Aniline and pyridine bases are capable of forming definite combinations with the haloid salts of zinc and cadmium.—On a combination of silver chloride with methylamine, by M. R. Jarry. The compound formed is $AgCl(NH_2.CH_3)$. Its dissociation pressures are given for temperatures ranging from 0° to 65° C.—On the search for naphthol-yellow and analogous colouring matters in white wines and cordials, by MM. Alberto d'Aguiar and Wenceslau da Silva.—The evolutive cycle of the Coccidia in the Arthropods, by M. Louis Léger.—The origins of the vaso-dila or nerves and their trophic centres, by M. J. P. Morat.—On the parallel folds forming the mass of Mount Blanc, by M. J. Vallot.—On the Tectonic of the Nivollet-Revard Chain, by MM. J. Révil and J. Vivien.—On the determination of the proximate composition of the gluten in wheat flour, by M. E. Fleurent. The gluten is separated into two constituents, named respectively glutenine and gliadine, by treatment with a solution of alcoholic potash of suitable strength. The ratio of glutenine to gliadine determines the baking value of the flour.—Researches on the biological action of the X-rays, by MM. J. Sabrazes and P. Rivière.—The postulates of geometry, by M. Léon Fabre.—Influence of the temperature of fermentation upon the amount of nitrogen in wines, by MM. L. Roos and F. Chabert.

AMSTERDAM.

Royal Academy of Sciences, March 27.—Prof. van de Sande Bakhuyzen in the chair.—Mr. Verbeek, on the geology of Bangka and Billiton. Both islands consist of sedimentary rocks, probably of palæozoic age-sandstones, quartzites and shales, broken through by granites. Both of them are covered with quaternary sediments, loose sand and clay, the lowest (perhaps pliocene) strata of which contain tin ore; along the coast are alluvial deposits. The tin ore deposits are newer than the granite eruption, but probably they are not much more recent. Mr. Verbeek next dealt with "the glass-balls of Billiton." In the quaternary or, perhaps, pliocene tin ore deposits of Billiton there occur peculiar, rounded glass-balls with grooved surfaces; they are also found, though very rarely, in certain quaternary tuff strata in Java, and in the equally quaternary gold and platinum mines of south-eastern Borneo. The author classed these objects with the diluvial "Bouteille"-stones (Moldavites) of Bohemia, and the quaternary glass-balls found in Australia, and described by Stelzner (*Zeitschr. d. d. g. Gesellsch.*, 1893, p. 299). The origin of none of these bodies is known. They cannot be of volcanic origin, because the nearest volcanoes are too far distant, and have, moreover, produced glassy rocks of quite a different nature. For various reasons they cannot be artificial either. The author, therefore, took them to be of non-terrestrial origin, and considered it probable that they are thrown out by lunar volcanoes during the quaternary and, perhaps, already during the pliocene period. The author drew attention to the researches of Landerer (*Comptes rendus*, cix. p. 360, and cxi. p. 210), which, it seems, tend to show that a large portion of the surface of the moon consists of acid glass-rocks.—Prof. Hoffmann on the teleneurones in the retina of *Leuciscus rutilus*, in connection with researches by Mr. A. G. H. van Genderen Stort.—Prof. Haga presented, for publication in the *Proceedings*, a paper by Mr. J. W. Giltay, entitled "Polarisation of telephonic receivers." In 1884 the author proved that the speaking condenser required a charging battery to be employed, and that the telephone necessitated the use of a permanent magnet, because otherwise the apparatus renders the sounds to be reproduced an octave too high. The author has lately repeated the experiments with the better microphones of recent times, and found that some condensers (paraffin paper, gutta-percha paper) also speak intelligibly, though disagreeably, without a polarising battery being used, in consequence of the stronger telephonic charges penetrating into the insulator. A mica condenser, without a battery, is perfectly unintelligible. When it has been connected with the battery for a few seconds, it speaks very distinctly, and continues doing so for some seconds after the removal of the battery. When the battery is left in connection with the mica condenser for some time, the polarising action of the battery is found to decrease gradually. After a minute or two the sound has become quite unintelligible. As soon as the battery is removed, the sound immediately becomes very distinct, which, however, lasts only a few seconds. The author cannot yet give an explanation of this phenomenon. A not too tight coil of insulated wire without any iron gives perfectly the same results as a condenser with writing-paper: altogether unintelligible without the battery, quite distinct with it.—Prof. van der Waals gave, on behalf of Mr. Z. P. Bouman, for publication in the *Proceedings*, a survey of the results of an experimental inquiry into the emission and absorption of glass and quartz at different temperatures. The results obtained with the radio-micrometer (in a somewhat modified form) for plates 1 mm. in thickness may be formulated as

follows: The emission curve of glass reaches its maximum at 4·6 μ, shifting but little with temperature. The curves have a broad "flattening" at about 3·5 $\mu - 4\mu$. The absorption curve shows the same particularity. The quotient $\frac{\text{emission}}{\text{absorption}}$ yields a curved line, whose maximum lies further towards the lesser λ's, absorption shifting in the inverse ratio to T. The emission and absorption of quartz correspond to each other. The two curves exhibit the same downward bends. In the quotient $\frac{\text{emission}}{\text{absorption}}$ the errors (per cent.) are too great to pronounce a positive opinion.

DIARY OF SOCIETIES.

THURSDAY, MAY 13.

ROYAL SOCIETY, at 4.30.—An Attempt to cause Helium or Argon to pass through Red-hot Palladium, Platinum, or Iron: Prof. Ramsay, F.R.S., and M. W. Travers.—On the Negative After-Images following Brief Retinal Excitation: Shelford Bidwell, F.R.S.—A Dynamical Theory of the Electric and Luminiferous Medium. Part III. Relations with Material Media: Dr. J. Larmor, F.R.S.—On a New Method of Determining the Vapour Pressures of Solutions: E. B. H. Wade.—On the Passage of Heat between Metal Surfaces and Liquids in Contact with them: T. E. Stanton.—On the Magnetisation Limit of Wrought Iron: H. Wilde, F.R.S.

ROYAL INSTITUTION, at 3.—Liquid Air as an Agent of Research: Prof. J. Dewar, F.R.S.

MATHEMATICAL SOCIETY, at 8.—On Cubic Curves as connected with certain Triangles in Perspective: S. Roberts, F.R.S.—An Analogue of Anharmonic Ratio: J. Brill.—An Essay on the Geometrical Calculus (Continuation): E. Lasker.—On the Partition of Numbers: G. B. Mathews.—Notes on Synthetic Geometry: W. Esson.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Generation of Electrical Energy for Tramways: J. S. Raworth. (Discussion.)—Disturbances of Submarine Cable Working by Electric Tramways: A. P. Trotter.

FRIDAY, MAY 14.

ROYAL INSTITUTION, at 9.—Explosion-Flames: Prof. Harold Dixon, F.R.S.

ROYAL ASTRONOMICAL SOCIETY, at 8.—Zodiacal Radiants of Fireballs: W. F. Denning.—On a New Binary Star with a Period of 5½ Years (β 883): T. J. J. See.—On the Mean Places and Proper Motions for 1900 of 24 Southern Circumpolar Stars: David Gill.—On the Determination of Terrestrial Longitudes by Photography: Captain E. H. Hills.—The Orbit of μ Draconis: S. W. Burnham.

PHYSICAL SOCIETY, at 5.—An Instrument for Comparing Thermometers with a Standard: W. Watson.—An Experiment in Surface Tension: A. S. Ackerman.—The Effect of Temperature on the Magnetic and Electric Properties of Iron: D. K. Morris.—The Formation of Mercury Films by Electric Osmosis: Rollo Appleyard.

MALACOLOGICAL SOCIETY, at 8.

SATURDAY, MAY 15.

GEOLOGISTS' ASSOCIATION.—Excursion to Chislehurst. Directors: W. Whitaker, F.R.S., and T. V. Holmes. Leave Charing Cross (S.E.R.) at 1.35; arrive at Chislehurst 2.19.

LONDON GEOLOGICAL FIELD CLASS.—Excursion from Snodland to Aylesford, to view the Gault. Leave Cannon Street 2.37.

MONDAY, MAY 17.

SOCIETY OF ARTS, at 8.—Design in Lettering: Lewis Foreman Day.

ROYAL GEOGRAPHICAL SOCIETY, at 2.30.—Anniversary Meeting.

VICTORIA INSTITUTE, at 4.30.—Paper by Dr. G. V. Pope.

TUESDAY, MAY 18.

ROYAL INSTITUTION, at 3.—Volcanoes: Dr. Tempest Anderson.

ZOOLOGICAL SOCIETY, at 8.30.—A Revision of the Lizards of the Genus *Sceloporus*: G. A. Boulenger, F.R.S.—Contributions to our Knowledge of the Plankton of the Faeroe Channel, II.: Dr. G. Herbert Fowler.—Further Contributions to the Knowledge of the Phytophagous Coleoptera of Africa, including Madagascar, Part II.; Martin Jacoby.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Notes on the Working of the Photo-Aquatint Process, and on some of the Apparatus used: T. Huson.

ROYAL VICTORIA HALL, at 8.30.—Adventure in South Africa: F. C. Selous.

WEDNESDAY, MAY 19.

SOCIETY OF ARTS, at 8.—London Water Supply: Prof. Percy F. Frankland, F.R.S

ROYAL METEOROLOGICAL SOCIETY (Burlington House), at 4.30.—The Rainfall of Dominica, West Indies: C. V. Bellamy.—On the Mean Monthly Temperatures of the British Isles, 1871–95: R. H. Scott, F.R.S., and F. Gaster.

ROYAL MICROSCOPICAL SOCIETY, at 7.30.—Exhibition of Specimens of Injections of other Objects: Ernest Hinton.

THURSDAY, MAY 20.

ROYAL SOCIETY, at 4.30.—Bakerian Lecture—On the Mechanical Equivalent of Heat: Prof. Osborne Reynolds and W. H. Moorby.

SOCIETY OF ARTS, at 4.30.—Kerman and Persian Beluchistan, with special reference to the Journeys of Alexander the Great and Marco Polo: Captain P. Molesworth Sykes.

CHEMICAL SOCIETY, at 8.—The Theory of Osmotic Pressure and the Hypothesis of Electrolytic Dissociation; Molecular Rotation of Optically Active Salts; Heats of Neutralisation of Acids and Bases in Dilute Aqueous Solution: Holland Crompton.—The Platinum-Silver Alloys: their Solubility in Nitric Acid: John Spiller.—A Comparative Crystallographical Study of the Normal Selenates of Potassium, Rubidium, and Cæsium: A. E. Tutton.

FRIDAY, MAY 21.

ROYAL INSTITUTION, at 9.—Contact Electricity of Metals: Lord Kelvin.

SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES (Tunbridge Wells), at 3.—What can be done to save our Fauna and Flora from unnecessary Destruction?: Rev. J. J. Scargill.—How can the Technical Education Grant assist Local Scientific Societies? S. Atwood and J. W. Tutt.—Local Museums: W. Cole.

EPIDEMIOLOGICAL SOCIETY, at 8.

BOOKS, PAMPHLET, and SERIALS RECEIVED.

BOOKS.—The Story of the Earth's Atmosphere: D. Archibald (Newnes).—The Naturalist's Directory, 1897 (Gill).—The Alternating-Current Circuit: W. P. Maycock (Whittaker).—Problems of Nature: Dr. G. Jaeger, edited and translated by Dr. H. G. Schlichter (Williams).—The Fauna of British India. Hymenoptera, Vol. i.: Wasps and Bees: Lieut.-Colonel C. T. Bingham (Taylor).—The Evolution of the Aryan: R. von Ihering, translated by A. Drucker (Sonnenschein).—The Young Beetle-Collector's Handbook: Dr. E. Hofmann (Sonnenschein).—Domestic Science Readers: V. T. Murché, Book vi. (Macmillan).—The Engineer's Sketch-Book of Mechanical Movements, &c.: T. W. Barber, 3rd edition (Spon).—The Vertebrate Skeleton: S. H. Reynolds (Cambridge University Press).—A History of Ancient Geography: H. F. Tozer (Cambridge University Press).—System der Philosophie: W. Wundt, Zweite Umgearbeitete Auflage (Leipzig, Engelmann).—Das Ellenbogengelenk und Seine Mechanik: J. W. Hultkrantz (Jena, Fischer).—Lehrbuch der Zoologie: Prof. R. Hertwig, Vierte Umgearbeitete Auflage (Jena, Fischer).

PAMPHLET.—The Origin of the Celestial Laws and Motions: G. T. Carruthers (Bradbury).

SERIALS.—Strand Magazine, May (Newnes).—Scribner's Magazine, May (Low).—Journal of Anatomy and Physiology, April (Griffin).—Imperial University, College of Agriculture, Bulletin, Vol. iii. No. 1 (Komaba, Tōkyō).—Journal of the Royal Microscopical Society, April (Williams).—Atlantic Monthly, May (Gay).—Fortnightly Review, May (Chapman).—Geographical Journal, May (Stanford).—Bulletin of the American Mathematical Society, April (New York, Macmillan).—American Journal of Mathematics, Vol. xix. No. 2 (Baltimore).—American Journal of Science, May (New Haven).—Proceedings of the Physical Society. Vol. 15, Part 5 (Taylor).

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