the maximum economical effect from gas, this result is best attained with burners of ample flow. Prof. W. D. Alexander describes, in a letter to the editor, the results of a careful survey of the crater of Haleakala in the island of Maui. F. W. Clarke gives a new method of separating tin from arsenic, antimony and molybdenum, based on the solubility of the sulphides of tin in oxalic acid solution. E. Billings, paleontologist of the Canadian Geological Survey, continues his notes on the *Crinoidea*, *Cystidea* and *Blastoidea*. A paper on a new spectroscope, with contributions to the spectral analysis of the stars, by Dr. Zöllner, is translated from the Proceedings of the Royal Society of Saxony. H. J. Clark has a paper on Polarity and Polycephalism, extracted from a forthcoming memoir on the anatomy and physiology of *Lucernariæ*, in which he treats of the discussion that has of late years prevailed as to whether the lower compound denizens of water are individuals or organs forming only a part of an individual. Dr. Sterry Hunt contributes a paper on Laurentian rocks in Eastern Massachusetts, in which he announces the discovery of Eozoön in the limestone of that district, by Mr. Bicknell. In a paper on the chemistry of common salt, Dr. Goessmann treats of the origin, occurrence and manufacture of salt. J. Lawrence Smith gives an account of the fall of meteoric stones in Alabama, with analyses, and points out the importance of a thorough re-examination of the mineral nature of meteoric stones. A. E. Verrill continues his contributions to zoology, from the Museum of Yale College, by describing Echinoderms and Corals from the Gulf of California and gives also a note on the generic relations and synonymy of the Common Sea-Urchin of New England (*Euryechinus Drobachiensis*) in which he replies to a criticism by M. Agassiz upon the author's classification of the species here referred to. E. S. Morse has a paper on the early stages of Brachiapods, describing the development of *Terebratulina Septentrionalis*, abundant in the waters of Eastport (Maine) and Dr. Jeffries Wyman has a paper on the existence of a Crocodile in Florida, said to have been killed near the mouth of the Miami river and considered by the author, as belonging to the sharp-nosed species (*C. acutus*).

SOCIETIES AND ACADEMIES

LONDON

Royal Society, February 3.—The following papers were read:—"Note on an Extension of the Comparison of Magnetic Disturbances with Magnetic Effects inferred from observed Terrestrial Galvanic Currents—and Discussion of the Magnetic Effects inferred from Galvanic Currents on days of tranquil magnetism." By George Biddell Airy, Astronomer Royal. (Received December 22, 1869.) The author, referring to his paper in the Philosophical Transactions for 1868, stated that he had examined the whole of the galvanic currents recorded during the establishment of the Croydon and Dartford wires (from 1865 April 1, to 1867 October 24). The days of observation were divided into three groups: No. 1 comprising days of considerable magnetic disturbance; No. 2, days of moderate disturbance, of which no further use was made and No. 3, days of tranquil magnetism. The points most worthy of notice are, that the general agreement of the strong irregularities, galvanic and magnetic, is very close; that the galvanic irregularities usually precede the magnetic, in time and that the northerly magnetic force appears to be increased. The author remarks that no records appeared open to doubt as regards instrumental error, except those of western declination; and to remove this he had compared the Greenwich curves with the Kew curves and had found them absolutely identical. In the discussion of the galvanic current-curves, on days of tranquil magnetism, for independent examination of the galvanic laws, the author explained the method of measuring the ordinates and connecting the measures into expressions for magnetic action, at every hour, grouping the measures, at the same nominal hour, by months and taking their monthly means for each hour. As these exhibited sensible discordance, they were smoothed by taking the means of adjacent numbers, taking the means of the adjacent numbers of the new series and so on, repeating the operation six times. The author explained the theory of this process and the way in which it tends to degrade the periodical terms of higher orders. He then explained an easy method of resolving the numbers so smoothed, into periodical terms recurring once or twice, or thrice in the day, &c. and applies the method to the numbers for every month. When these quantities (which from month to month are perfectly independent) are brought together in tables, they present such an agreement, with gradual change accompanying the change of seasons, as to leave no doubt of their representing a real law of the diurnal changes of the galvanic currents. They also show the existence of a constant turn towards the north (explaining the apparent increase of force to the north observed in the results for days of great disturbance), and a still larger force towards the west (also well marked on the days of great disturbance). No light is obtained as to the origin of these turns; but they appear to be probably pure galvanic accidents, depending on the nature of the earth-connections. The author then exhibited, in curves, the diurnal inequalities of magnetism which the galvanic currents must produce. The form generally consists of two parallel lobes, making with the magnetic meridian an angle of nearly 60° from the north towards the west. The greatest east-and-west difference of ordinates, in the month of April, is 0·00044 of total horizontal magnetic force; it corresponds in the hours to which those ordinates relate, nearly with the ordinary diurnal inequality. But it is much smaller than the ordinary diurnal inequality and the daily law of the galvano-magnetic inequality differs greatly from that of diurnal inequality. For the greater part, therefore, of diurnal inequality the cause is yet to be found.

"On the fossil mammals of Australia.—Part III. *Diprotodon australis*, Owen." By Prof. Owen, F.R.S., &c. Received December 10, 1869. In this paper the author communicated his descriptions of *Diprotodon australis*, with figures of the fossil remains at his command, which have been received from various localities in Australia, since the first announcement of this genus founded on a fragment of lower jaw and tusk described and figured in the "Appendix" to Sir Thos. Mitchell's "Three Expeditions into the Interior of Eastern Australia," 8vo, 1838. The fossils in question include the entire cranium and lower jaw, with most of the teeth, showing the dental formula of: $-i\frac{3-3}{1-1}, c\frac{0\cdot0}{0\cdot0}, m\frac{5-5}{5-5} = 28$; portions of jaws and teeth exemplifying characteristics of age and sex; many bones of the trunk and extremities. The author described the skull and teeth and the result of the comparisons, establishing the marsupial characters of *Diprotodon* and its combination of characters of *Macropus* and *Phascolomys* with special modifications of its own, which are more fully and strongly manifested in the bones of the trunk and limbs, subsequently described. The pelvis and femora present resemblances to those in *Proboscidea*, not hitherto observed in any other remains of large extinct quadrupeds of Australia. But in all the bones described, essentially marsupial characteristics are more or less determinable. A summary of the characters of *Diprotodon* illustrated the conditions of its extinction, its analogies with the *Megatherium*, its affinities to existing forms of *Marsupialia* and the more generalised condition which it manifests of that mammalian type. A table of the localities, in Australia, from which remains of *Diprotodon* have been obtained and a table of the principal admeasurements of the skeleton, are appended to the text.

Royal Astronomical Society, January 16.—Third meeting of the Session.—Mr. De la Rue, vice-president, in the chair. The chairman announced that the president, though he was recovering his health, was not able to take the chair. Thirty-one presents were announced and the thanks of the society voted to their respective donors. The first paper read was a communication from Sir John Herschel, having reference to a supplementary list of eighty-four double stars observed at Slough since the year 1820. Amongst these were many observed by the elder Struve and an interesting portion of the communication referred to the relation between Sir John Herschel's estimate of the magnitudes of stars and Struve's. It appeared from the comparison that Herschel's magnitude 3·0 corresponded to Struve's 2·6 and the difference gradually widened from successive magnitudes until from the lowest orders the two lists were altogether discordant. A similar relation was observed (we believe by Mr. Knott) between the magnitudes in Admiral Smyth's Bedford catalogue and Argelander's estimates.—A communication from Mr. Joynson, having reference to observations made on occultations and on phenomena of Jupiter's satellites, was then read.—In a paper containing a list of occultations, Captain Noble referred to an estimate, by Mr. Penrose, of the latitude of the former's observatory as deduced from an occultation of ζ Ceti.—The next paper, by Commander Davison, on the November meteors as seen at Santa Barbara, California, con-

tained several interesting diagrams.—The annual statement of the observations made on the sun at Kew was then read. It appeared from this that sun-spots have scarcely been so numerous as was to have been expected so near the epoch of maximum spot-frequency. The sun was observed on 96 days during the year 1869; there were no days when the sun was without spots and 224 new groups made their appearance.—Mr. Browning then read an account of a new method of measuring the position of lines in the spectrum. In this arrangement an illuminated cross is made to traverse the spectrum by turning a micrometer screw. Mr. Browning mentioned that he had found it perfectly impossible, by the ordinary mode of measurement, to deal with the faint spectrum of the planet Jupiter. The spectrum itself was nearly obliterated and the lines in it were rendered altogether invisible. He remarked that though Jupiter is so bright, its spectrum is fainter than that of a second magnitude star, even when the latter spectrum is made as wide as that of the planet (a peculiarity obviously depending on the fact that we use but a portion of a planet's light in observing its spectrum, while the linear image of a star includes the whole of the star's light). Mr. Bidder, referring to Mr. Browning's method of bringing the illuminated cross upon the spectrum, said that he had often thought Sir W. Herschel's plan of comparing double stars with movable lights placed at some distance from the observer might, with modifications, be applied to the micrometrical measurement of double stars. He described an arrangement he had tried for this purpose. Messrs. Huggins and Lockyer made some suggestions on the mode of measuring the plan of lines in the spectrum, the former pointing out the necessity of having the cross differently coloured for measuring lines in different parts of the spectrum and showing how this might be done by means of a small prism: the latter remarking that some arrangement was desirable by which the lantern might be so shifted, while the micrometer screw was turned, as not to alter the conditions under which the spectrum was observed. At the chairman's request, Mr. Lockyer then gave an account of Mr. Newall's great telescope, a Cooke refractor, 25 inches in clear aperture, remarking that it was a noteworthy circumstance, that a telescope of this size should have been mounted in the so-called German manner; that is, not on a long polar axis; but on the Fraünhofer stand, familiar to his hearers. He said that Mr. Newall proposed to devote the powers of this instrument in the most generous manner to the interests of science and that when it had been erected in a suitable climate, astronomical workers would be invited to avail themselves of its powers. The chairman then asked if any information could be given respecting Mr. Buckingham's 21-inch refractor, from whose performance so much had been expected. Mr. Buckingham, who was present, said that he had only that evening been observing Jupiter with it; and he had to remark, with reference to the ruddy colours of the equatorial belt which had recently been attracting so much attention, that in his powerful instrument he could clearly discern red masses resembling clouds in shape, on a white background. One band, in the red part of the spectrum, was at present invisible. The chairman invited Mr. Buckingham to make some frequent communications respecting the great telescope's performance. He also confirmed the statements made by Mr. Buckingham respecting the present aspect of the planet. Colonel Strange then gave a most interesting account of a transit-instrument constructed by the late Mr. Cooke on the Russian plan (so called) and Mr. Carrington mentioned that the instrument should properly be called the Harris transit, after a countryman of our own who devised the method. The instrument, which is intended to be used by those engaged in the survey of India, was exhibited at the meeting. Instead of the ordinary arrangement, the optical axis of the instrument is divided into two halves at right angles to each other, one corresponding to the object half of an ordinary transit, the other being in the horizontal axis of the instrument; so that the eye-piece is placed at one end of the horizontal axis and the observer stands on one side of the instrument. The advantages of the arrangements are obvious: the eye is always at the same height and the vision always directed horizontally. On the other hand, Colonel Strange remarked that he could not altogether get rid of his dislike to the plan. He thought all who had been engaged in actual observation would agree with him that the less the cone of light forming the object-glass was tampered with the better. But passing over that and minor objections, there remained this important point to be considered. In the ordinary arrangement, any disturbance of the collimation, whether taking place at the object-end or at the eye-end of the instrument, produced effects varying inversely as the distance separating the object-glass from the eye-glass. In the new arrangement, if the prism by which the rays from the object-glass were reflected towards the eye-glass were disturbed, the effects would be increased in precisely the same proportion that the distance between the prism and the object-glass is less than that between the eye-piece and the object-glass in the ordinary arrangement. The answer to this was, that the prism in effect never does get disturbed; but, for his own part, he thought this could hardly be looked upon as established. There was this further objection (first pointed out by Captain Clarke) to be considered, that there was a variation in the collimation—errors according to the position of the instrument. An interesting discussion ensued, during the course of which the possible disturbances resulting from the heat, or from the weight of the observer, were discussed and the performance of the instrument compared with that of such an instrument as Mr. Carrington is about to employ, in which the whole of the telescope's axis is always horizontal. Mr. Stone was then invited to give an account of his researches into the heating powers of the stars, which he did in a most interesting and lucid manner. The substance of his remarks has already appeared in these columns under another heading.

Zoological Society, January 27.—Prof. Newton, V. P., in the chair.—A letter was read from Mr. R. B. White, concerning the hairy tapir (*Tapirus roulini*) of the Andes of New Granada, of which he was endeavouring to obtain specimens for the Society's menagerie.—Dr. Cobbold, F.R.S., exhibited specimens of, and made remarks upon, the new entozoön from the Aard-wolf, described at the last meeting of the society, and proposed to be called *Acanthocheilonema dracunculoides*.—Mr. G. D. Rowley, exhibited and made remarks upon a specimen of the Siberian lark (*Alauda sibirica*), recently taken at Brighton, and believed to be the first example of this species that had occurred in the British Islands. He also exhibited some other rare birds from the same locality.—Prof. Newton, in exhibiting a specimen of the North American *Zonotrichia albicollis*, shot near Aberdeen, and sent to him for that purpose by Mr. W. C. Angus, called attention to the injudicious practice of many ornithologists who are prone to give the name of "British Birds" to all such foreign species as occasional stray to this country.—A communication was read from Professor Owen, containing a letter received from Dr. Haast, F.R.S., on the discovery of cooking-pits and kitchen-middens containing remains of various species of *Dinornis*, in the province of Canterbury, New Zealand.—Mr. P. L. Sclater read a paper on some new or little-known birds from the Rio Paranà, collected during the second survey of the river by Captain Page, U.S.N. and submitted to him for examination by the Smithsonian Institution.—Dr. W. Baird communicated a description of a new genus and species of shells from Whydah, on the West Coast of Africa, proposed to be called *Prtoma*, together with some remarks on the genus *Proto* of Defrance.—Mr. R. B. Sharpe read a paper on the genus *Pelargopsis* of the family *Alcedinidæ* and pointed out the geographical distribution of the eight species of this genus in the Indian and Australian regions.—Mr. Sharpe also exhibited and pointed out the characters of a new species of *Campephaga* from Damara-land, which he proposed to call *Campephaga Anderssoni*, after the late Mr. C. J. Andersson, its discoverer.—Dr. J. E. Gray communicated some notes on the skulls of the whales of the genus *Orca* in the British Museum, and a notice of a specimen of the same genus from the Seychelles.—A communication was read from Dr. J. C. Cox, containing descriptions of seventeen new species of land shells from the South Sea Islands. The original specimens were stated to be in the cabinet of Mr. John Brazier, of Sydney.—A communication was read from Lieut.-Col. Playfair, containing an account of a fresh-water fish recently discovered in the vicinity of Aden, which appeared to referable to the widely-distributed Cyprinoid, *Discognathus lamta*.—Dr. J. Murie read a note upon a larval æstrus found in the orbit of the hippopotamus, to which was added a list of the species of mammals in which æstri-larvæ have hitherto been found.—Dr. Murie also read a note on a specimen of the so-called *Aquila Barthelemyi* recently living in the Society's Gardens, which appeared to be nothing more than a variety of the Golden eagle *Aquila fulva*.

Chemical Society, February 3.—Prof. Williamson, F.R.S., President, in the chair. Mr. Chapman read a note on the

organic matters contained in the air. Some time ago the author in connection with Mr. Wanklyn and Mr. Smith, found that the smallest traces of nitrogenous organic matter in water could be detected by converting the nitrogen of the organic matter into ammonia and estimating the latter with the Nessler test. It occurred to the experimentors that the process might be extended to the investigation of the air by washing it with water. But Mr. Chapman found the operation of washing the air more difficult than he had expected. It seemed the most obvious method to draw air through water, or through some other medium which would have afterwards to be washed with water. The absorption by water alone proved insufficient. Filters of cotton wool and gun cotton acted very well; but neither of the two materials could be obtained free from traces of nitrogenous substances. Asbestos seemed to be sufficiently good; but the preparatory treatment it has to undergo before its use in the experiment, is too troublesome. Lastly, finely powdered pumice-stone was tried as a filtering medium and was found satisfactory in all respects. It has to be heated to redness before it is employed and is then moistened with some water spread over coarser pieces of pumice, which rest on wire gauze fitted into a funnel. The funnel is connected with one neck of a Wolfe's bottle, whilst the other neck is joined to an aspirator. When a sufficient quantity of air—say 100 litres—has been drawn through the apparatus, then a pumice is transferred to a retort which contains water freed from ammonia and organic matters and the operation is now proceeded with exactly as if it were an estimation of nitrogenous organic matter in a sample of water. By this method Mr. Chapman found that the air of crowded rooms contains suspended fixed organic particles, as well as volatile bases. The first can be removed by filtration through cotton wool, the latter pass through the filter and when conducted into water can be detected therein. Air collected from the neighbourhood of a sewer contained notable quantities of those volatile bases. The author thinks it would be of interest to investigate by the above-described method the air in hospitals, fever wards and the like places. With respect to the examination of the volatile bases occurring in the air, Dr. Mills suggested that the charcoal out of the "Stenhouse air filter" might furnish a good means for collecting those bases.—In another paper Mr. Chapman communicated some new reactions of alcohols. Amylic alcohol, as commonly obtained, consists of two liquids, one rotating the polarised ray, the other not. The two may be separated by distilling the mixture from soda, calcic chloride, &c. The non-rotating alcohol is retained, the rotating distills over. But by repeated distillations it was found that the rotating alcohol is converted into the non-rotating by the very treatment employed to separate the two. No difference in the physical properties of the two alcohols is perceptible. The compounds of the non-rotating liquid do not turn the ray of polarised light; those of the rotating do and that in an opposite direction to the original alcohol. These facts seem to indicate that the internal structure of organic compounds is not so permanent as the habit is of thinking them. Another observation Mr. Chapman made whilst pursuing these experiments was, that caustic soda is not merely unable to dry alcohol, as is well known, but that it actually moistens it. On proper investigation, it turned out that the sodium replaces the hydrogen of the alcohol, whilst the displaced hydrogen takes the place of the sodium in the caustic soda and thus produces water. Referring to this latter observation, the president remarked that it confirmed the idea of a double decomposition taking place when potassic hydrate is dissolved in alcohol, an idea derived from the well-known reaction of carbonic action on a solution of potassic hydrate in alcohol, whereby ethylo-potassic carbonate as well as potassic carbonate is formed.—Mr. Perkin exhibited a modification of Berthelot's method for the synthesis of hydric cyanide (prussic acid) by direct union of acetylene and nitrogen under the influence of the electric spark. Mr. Perkin takes advantage of the fact that nearly all the hydro-carbons, when submitted in the state of vapour to the action of the spark, yield more or less acetylene. Nitrogen was caused to bubble through benzole, then to pass through a globe in which the spark was discharged and thence into a solution of silver. Even after a few seconds, abundant evidence of the formation of hydric cyanide was obtained. Hydric cyanide is further produced when the spark is discharged in a mixture of ammonia-gas and ether vapour. If, however, nitrogen instead of ammonia is employed, no prussic acid is formed. Mr. Perkin's modification of Berthelot's method is well adapted for purposes of lecture demonstration.

Royal Geographical Society, January 24.—Sir R. Murchison, president, in the chair. A letter from Mr. Hayward detailing his plans of reaching the Pamir Steppe, by way of Ghilghit, was read. He expected to winter in Ghilghit and hoped to be at Lake Karakol next May; he proposed to thoroughly lay down the positions of the Pamir Steppe and the basin of the Jaxartes. An account of Easter Island, or Rapa Nui, by Mr. Palmer, R.N., was then read. The island lies in 27° 8′ 46″ S., long. 109° 24′ 36″ W., about 1,000 miles from Pitcairn. It is volcanic and contains several extinct craters, the highest point being 1,100 to 1,200 feet high. The principal craters are Te Rana Kau, the depth of which is 700 feet; Te Rano Hau, whence came the tufa of which the hats or crowns of the images are made; and Te Rana Otu Iti, where the images were sculptured of grey lava. There is no water, save in pools, which are 26 feet deep and one spring, mineral, but potable. The coast is ironbound, without harbours. The character of the natives has been much improved by the teaching of the Jesuit Fathers and they now are scrupulously honest. They are perfectly idle, content to starve rather than work; number about 900—600 women to 300 men and will probably, ere long, die out. They make and sell well-carved wooden figures, with eyeballs of obsidian, ornamented with double-headed "aronies," or birds—and other figures. They are described by all visitors as a tall, almost white, race; the women handsomer than those of the Marquesas. They are not idolatrous, but believe in a Great Spirit. The dead, swathed in grass, are laid on platforms, heads to seaward. They have a tradition that they came from Oparo. The platform for the images faced the sea, supported by a stone wall seven or eight yards high, built of dry stones six feet in length; the platform was 100 paces long and thirty feet deep, terminating landwards in a step three feet high. It was strewn with bones; all the images had been thrown down. Near that, on an area paved with large stones, stood a pillar of red tufa, six feet high, on which were two skulls, apparently twelve or fourteen years old. A place of cremation was near this. The images amount to several hundreds, some unfinished. In the crater of Otu Iti they vary in size from thirty feet (of which the head measures two-thirds) to five feet. They are marked by excessive shortness of the upper lip; the eyeballs, of obsidian, are lost; the ears display very long pendant lobes; each image has its own name; some have "hats" or crowns, some have the heads cut flat to receive them; the tools seem to have been long boulders ground down with obsidian—only one specimen was found. The paper was illustrated by numerous drawings made on the spot and enlarged pictures taken from them. Mr. Markham pointed out the resemblance between these remains and the Imarra works in the vicinity of Lake Titicaca, in Peru and advocated the theory that this island had been a stepping-stone for the successive arrivals of immigrants into Peru and perhaps revered as a holy isle whither the Incas sent ships. The Peruvian images were dispersed like those of Easter Island, as though walking through the country; the present islanders were simply Polynesians and probably not descendants of the sculptor-race. Mr. Franks pointed out the resemblance of some peculiarities in the wooden figures now made and the stone images; at the same time the wooden figures brought home by Cook and now in the Museum, differed materially from those brought in 1840—the change of style, therefore, would not imply a change of race. The want of forest timber might have occasioned the employment of the soft volcanic tufa and a long lapse of time would account for the numbers of images found. Sir G. Grey stated that all Polynesians were addicted to carving—if the wooden figures carved in New Zealand had not decayed there would be now thousands of them; there were in these islands traditions of stone figures brought from other islands. Mr. Palmer said, in reply, that he had not formed any theories on the subject; but only recorded what he saw; the people had all been withdrawn to the settlement in consequence of the Peruvians having kidnapped some hundreds to work the guano deposits.

Anthropological Society of London, February 1.—Captain Bedford Pim, R.N., V.P., in the chair, "On the negro slaves in Turkey," by Major Frederick Millengen, F.R.G.S. The author exposed first the particulars connected with the sale of negro slaves in Mussulman countries, then described the condition of negroes in Turkey and concluded by some general

observations. The negroes imported into the Sultan's dominions come from the countries situated on the higher basin of the Nile; and though that valley is the route followed by the cargoes of slaves on their way to the markets, numbers of secondary channels exist, through which slave-dealers convey their merchandise. The causes of the supply are the feuds of the negro races, the causes of demand are that slavery is inherent in the religious system of Mussulman nations, inherent in their social system and congenial to their ideas and manners. The author considered that Sir Samuel Baker's expedition to put a stop to the slave trade must end in failure; and he quoted the speech of Lord Houghton plainly avowing the disappointment felt by his friend Sir Samuel Baker on seeing the Mussulmans hostile to his scheme. In conclusion, the author said that, if the Sultan and Khédive really intend doing away with slavery, they have nothing else to do but to open wide the gates of their harems.

DUBLIN

Natural History Society, February 2.—Mr. R. P. Williams in the chair. Dr. A. W. Foot exhibited a young bitch terrier suffering from goitre and made a few remarks on the subject of goitre in animals. The list of animals affected with this complaint includes the lion, hyæna, racoon, monkey, cat, dog, horse, mule, pig, cow, sheep and mouse. The geological conditions which appear to be connected with the occurrence of this disorder in animals were discussed and commented upon. —Prof. Macalister read a paper "On some points in the anatomy of the sartorius muscle."—Dr. A. W. Foot exhibited thirteen species of dragon flies, collected during the past summer in the county of Wicklow: *Agrion elegans, minium, puella, cyathigerum; Lestes nympha, Calypteryx virgo, splendens, Æschna pratensis, juncea, grandis, Libellula quadrimaculata, striolata* and *cærulescens*.

MANCHESTER

Literary and Philosophical Society, January 25—J. P. Joule, LL.D., F.R.S., &c., president, in the chair.

"On organic matter in the air." By Dr. R. Angus Smith, F.R.S., &c. In referring to the new experiments by Prof. Tyndall on this subject, the author mentioned that he had long ago proved the existence not only of inorganic and organic material; but also of organised bodies in the atmosphere. He did not claim to have originated the idea that this is the case; but rather to have furnished proof and quantitative demonstration of the fact, as far back as 1846, when he brought a notice of the subject before the Chemical Society and, in 1848, in a report to the British Association; having also followed up the inquiry since then, in conjunction with Mr. Dancer and published his results at various times. In conclusion he says we must not be panic-stricken because of the presence of organised germs in the air. Some are hurtful; but it may be that others are required for the maintenance of healthy animal life exactly as in vegetable fermentation.

Prof. Williamson exhibited some specimens affording additional information as to the organisation of calamites. Through Mr. Butterworth he had succeeded in obtaining examples whose structure was intermediate between calamodendron and calamopitus. In the general arrangement of separate parts the new specimens corresponded closely with the type figured by Mr. Binney; but they differ in two important particulars. All the fibro-vascular tissues are of the reticulate type seen in calamopitus and dictyoxylon, with a few scalariform vessels here and there. The cellular laminæ separating the vascular wedges exhibit remarkable variations even in the same specimen; the cells being sometimes elongated into vertical forms of prodenchyma—sometimes extended transversely and still more frequently they consist of ordinary parenchyma. In some the fibro-vascular tissues of the wedges are separated by masses of cellular tissue, both at the nodes and internodes. These tissues, or modified medullary rays, are so numerous in one example, that more than two vertical vessels can scarcely be found in contact without the intervention of one of these vertical rows of mural cellular tissue. In other specimens these medullary rays are much more scanty, as if connecting the type under consideration with that figured by Mr. Binney. In these new examples, the verticillate medullary radii of calamopitus are wholly wanting. Additional proof is thus afforded that all three of the types may be only variations of the common calamodendron and it thus becomes more demonstrable that in the Lancashire coal-field, at least, we have no evidence of the existence of an equisetiform type of calamite distinct from the calamodendroid one. The author further announced the discovery by Mr. Butterworth of a young calamite in which the vertical layer is well preserved, presenting a parenchyma of somewhat remarkable structure and of a thickness equal to the ligneous zone which it invests. Its further description will be given after investigation.

"On the so-called molecular movements of microscopic particles." By Professor Stanley Jevons, M.A. In studying the phenomenon first pointed out by Robert Brown in 1827, the author found that silicates appeared to be generally the most active substances in this respect, pure quartz crystal in fine powder maintaining rapid oscillation: but charcoal, red phosphorus, antimony and sulphur were also very active. Metallic oxides and earthy salts, such as carbonate of lime, appeared to be less active; but it cannot be said any substance is free from such motion. On varying the liquid, however, by dissolving salts in it, the fact became apparent that pure distilled water gave rise to the greatest activity. The motion appeared to be closely connected with the suspension of fine powder in water, a fact already noticed by Dujardin.* All acids, alkalis, or salts which checked the motion were found to facilitate the subsidence of suspended material. Gum arabic, on the contrary, prevents subsidence and it has a remarkable power of exciting the molecular motion. The author was soon convinced that the motion was due to electrical action, by the close analogy with the circumstances under which electricity is produced by the hydro-electric machine, pure water alone producing much electricity, while almost any salt, acid, or alkali prevented the action by rendering the water a conductor. Ammonia, however, is a remarkable exception in this respect and it does not stop the molecular motion or facilitate subsidence of suspended material. Boracic acid, likewise, is a non-conductor and does not cause subsidence.

However, acetic acid, which Faraday stated did not render water a conductor, does, in common with other vegetable acids, occasion subsidence. It is probable that silicic acid does not render water a conductor, since silicate of soda tends to increase the molecular motion rather than otherwise and this is another exception to the general influence of soluble substances in causing subsidence.

The author is of opinion that this motion of suspended particles is closely connected with the phenomena of osmose as a case of action and reaction; for, if a liquid be capable of impelling a particle in a given direction, the particle, if fixed, would be capable of impelling the liquid in an opposite direction with an equal force. The earthenware jars used by Graham were composed of a substance highly active under the microscope, and the fact that osmose is chiefly an affair of very dilute solutions, certainly accords with the electric origin of the molecular motion, which the author considered to be established experimentally, pointing to the experiments of Wiedemann on electric osmose as suggesting a speculative explanation. Solid particles of organic substances also exhibit the motion; albumen, distrin, sugar, starch-solution, alcohol, &c., have little power to arrest the motion. The author thinks it not unlikely that, when these phenomena are fully investigated, they will give strong support to the theory lately put forward by Becquerel, that the movements of liquids in animals and plants are really due to electric action. Mr. Dancer stated that particles approaching to a spherical form showed the greatest activity with some few exceptions, as in the case of sublimed mercury and sulphur. He did not regard electric action as a satisfactory explanation of the phenomenon, and thought the results of many experiments pointed to heat as a probable cause.—"On a general system of numerically definite reasoning," by Prof. W. Stanley Jevons, M.A. The substance of this paper was given in the report of the Royal Society's proceedings for January 20.

LIVERPOOL

Naturalists' Field Club, January 14.—The Rev. H. H. Higgins, president, in the chair. The President informed the members that Mr. H. S. Fisher was in communication with some botanists in the south of England, with the view of obtaining exchanges of specially local plants and that he had been successful in supplying a gentleman in Cornwall with fifty or sixty specimens of plants, placed in a list of desiderata forwarded by him—among them *Centaurea latifolia*—a plant peculiar to Crosby in this neighbourhood. He also mentioned that he had witnessed the phenomenon known as the Zodiacal Light at Rainhill on the 19th of December last, at 4.25 P.M. In substance, but not in form, it resembled the tail of a comet.—Mr. Gibson then read a

* Manuel Complet de l'Observateur au Microscope. Paris: 1843, p. 60.

short paper on the Parasitic character of *Pyrola rotundifolia*—Wintergreen—and stated his belief, founded on minute personal investigation, that it *is* Parasitic on the root of the dwarf willow, *Salix repens*. He never found Pyrola where the willow was absent and in some cases he detected the fibrous roots of the Pyrola apparently growing on those of the willow.

BRIGHTON

Brighton and Sussex Natural History Society, January 13.—The president, Mr. T. H. Hennah, in the chair. The receipt of a copy of a paper by Mr. C. Roper, on the Decapod Crustacea found at Eastbourne, was announced.—Mr. J. E. Mayall communicated a note on what he believed to be a new fact in connection with coal gas. While engaged in the spectrum analysis of organic bodies, he had found his results interfered with by the presence of copper. Examining the solutions and no trace of copper being found, it occurred to him that it might be present in the common coal gas used in the Bunsen lamp, in which the incandescence of the organic matter was produced. Having candles with wicks dipped in the chlorides of various metals always at hand as standard spectra, on comparing the flame of a copper candle with that of the gas under examination, their spectra were found to be identical. From this he inferred the copper was generated from pyrites contained in the coal. Mr. J. E. Mayall then read a paper on Volcanic Theories.

PARIS

Academy of Sciences, January 24.—M. Lecoq de Boisbandeau communicated a note on the continuity of luminous spectra, in which he developed his theory of the production of spectra by inequalities in the luminous molecules, and referred especially to the phenomena presented by rubidium, cæsium, and potassium.—At this meeting there were no other papers on subjects of any special importance.

January 31.—M. Vérard de Sainte-Anne read a Memoir on a project for establishing a communication between France and England. The author proposes the establishment of a railway bridge, either open or tubular, across the Straits of Dover. A continuation of M. J. Boussineq's memoir on the theory of the flow of a liquid through an orifice in a thin partition was presented by M. de Saint-Venant.—M. Gaiffe communicated a letter containing remarks on the process employed by Mr. Adams to produce deposits of nickel by electrolytric action, in which he maintained that the neutral chloride and sulphide of nickel and ammonia with no trace of free fixed alkali can alone furnish workable baths.—M M. Becquerel maintained that the presence of soda and potash does not hinder the deposition of the nickel.—M. A. Lallemand stated that when a solution of sulphur in sulphide of carbon is exposed to solar light concentrated by a lens, insoluble sulphur is produced: the spectrum of the emergent light is deficient in all the rays between G and H and the ultra-violet spectrum has entirely disappeared. A solution of phosphorus in sulphide of carbon is similarly acted upon.—M. Cahours presented a note by M. L. Daniel, giving an account of some interesting experiments with vacuum-tubes under the influence of magnetism.—A note on the heat of combination of boron with chlorine and with oxygen, by MM. L. Troost and P. Hauteville, was presented by Mr. H. Sainte-Claire Deville, who also communicated a paper by Mr. Landrin on the division of a limited quantity of acid between two bases employed in excess. From his experiments it appears that the oxides are dissolved in simple equivalent proportions, *i.e.*, 1 to 2, 3, 4, 5, &c.—A note by M. E. Bourgoin on the cause of the unequal loss of oxalic acid at the positive and negative poles and on the nature of oxalic acid when dissolved in water, was presented by M. Bussy. The loss by decomposition is three times as great at the positive as at the negative pole; the gas disengaged at the former is pure carbonic acid, at the latter hydrogen. The author concludes that the composition of oxalic acid in solution in water, is $C^4 H^2 O^8$, 2 H^2, O^2.—M. C. Dareste read a paper on the convolutions of the brain.—M. P. Gervais presented a reply to the observations of M. Balbiani on the ova of the *Sacculinæ*, by M. E. Van Beneden and M. A. L. Donnadieu noticed a case of monstrosity (hemiterism) in a carp.—M. A. Chatin communicated a note on the cause of the dehiscence of the anthers of plants, in which he denies that this phenomenon is due exclusively to the fibrous cells of the endothecium as supposed by Purkinje and shows that in some cases certainly and in many others probably, the exothecium or epidermic layer plays an important part in it.

DIARY

THURSDAY, FEBRUARY 10.

ROYAL SOCIETY, at 8.30.—On some remarkable Spectra of Compounds of Zirconia and the Oxides of Uranium: H. C. Sorby, F.R.S.—On the Mathematical Theory of Stream Lines, especially those with four foci and upwards: Professor Rankine.—On Linear Differential Equations: W. H. L. Russell, F.R.S.
MATHEMATICAL SOCIETY, at 8.—Quartic Surfaces: Prof. Cayley.
ZOOLOGICAL SOCIETY, at 8.30.—On a new Cervine Animal from the Yang-tze-Kiang: R. Swinhoe.—On the Size of the Red Corpuscles of the Blood of *Moschus*, *Tragulus*, *Orycteropus*, *Ailurus* and some other mammalia, with historical notices: G. Gulliver.
ANTIQUARIES, at 8.30.
LONDON INSTITUTION, at 7 30.

FRIDAY, FEBRUARY 11.

QUEKETT MICROSCOPICAL CLUB, at 8.—For exhibition of objects and microscopic gossip.
ROYAL INSTITUTION, at 9.—The Deep Sea: Dr. Carpenter.
ASTRONOMICAL SOCIETY, at 3.—Anniversary Meeting.

SATURDAY, FEBRUARY 12.

ROYAL BOTANIC, at 3.30.

MONDAY, FEBRUARY 14.

MEDICAL SOCIETY, at 8.
ROYAL INSTITUTE OF BRITISH ARCHITECTS, at 8.

TUESDAY, FEBRUARY 15.

ANTHROPOLOGICAL SOCIETY, at 8.—On the Aborigines of the Chatham Islands: Dr. Barnard Davis and A. Welch.—Polygamy: Dr. John Campbell.—Inscribed Stone from Venezuela: R. Tate.
PATHOLOGICAL SOCIETY, at 8.
STATISTICAL SOCIETY, at 8.—On International Coinage and the Variations of Foreign Exchanges during recent years: E. Seyd.
INSTITUTION OF CIVIL ENGINEERS, at 8.
ROYAL INSTITUTION, at 3.—On the Architecture of the Human Body: Prof. Humphry.

WEDNESDAY, FEBRUARY 16.

SOCIETY OF ARTS, at 8.—On Emigration: T. Plummer.
METEOROLOGICAL SOCIETY, at 7.

THURSDAY, FEBRUARY 17.

ROYAL INSTITUTION, at 3.—Chemistry: Prof. Odling.
LINNEAN SOCIETY, at 8.—On the Tree Ferns of British Sikkim: Mr. Scott.
CHEMICAL SOCIETY, at 8.
ZOOLOGICAL SOCIETY, at 4.
ANTIQUARIES, at 8.30.
ROYAL SOCIETY, at 8.30.

BOOKS RECEIVED

ENGLISH.—Transactions and Proceedings of the New Zealand Institute, 1868: Edited by J. Hector, M.D. (Trübner).—The Year Book of Facts: J. Timbs (Lockwood and Co.).

FOREIGN.—Bericht über die Fortschritte der Eisenhütten-Technik im Jahre, 1867, nebst einem Anhange enthaltend die Fortschritte der anderen Metallurgischen Gewerbe: A. K. Kerpely.—Studien aus dem Institute für experimentelle Pathologie in Wien aus dem Jahre, 1869: S. Stricker.—Zeitschrift für Parasitenkunde: Dr. E. Hallier and Dr. F. Zürn.—Handbuch der theoretischen und clinischen Percussion und Auscultation vom historischer und critschen Standpuncte bearbeitet: Dr. P. Niemeyer.—Beiträge zur Naturkunde Preussens herausgegeben von der königlichen physikalisch-ökonomischen Gesellschaft zur Königsberg: miocene baltische Flora: O. Heer.—Landwirthschafliche Zoologie: Dr. C. E. Giebel (Williams and Norgate).

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