border of the New Haven region, by J. D. Dana.—A new Tertiary lake basin, by G. B. Grinnell and E. S. Dana. During recent explorations a new series of Tertiary deposits has been found at Camp Baker, Montana; they indicate the existence in this region of a Miocene lake basin, which was succeeded by another lake basin in Pliocene time.—The remaining papers are: The product of the action of potassium on ethyl succinate, by Ira Remsen.—The action of ozone on carbon monoxide, by the same.—The appendix contains an article on the Dinocerata, by O. C. Marsh, with five plates.

Journal de Physique, Dec. 1875.—We simply name the principal papers in this number, which are mostly of a mathematical nature:—Application of the laws of Coulomb to electrolytes, by M. G. Lippmann.—On the determination of condensing power, by M. Terquem.—On the magnetisation of steel by currents, and on the situation of the poles in long needles, by M. Bouty.—On an experiment relative to the transformation of forces (we refer to this more fully elsewhere).—Criticising a paper of Mr. Tomlinson's on the action of solids in liberating gas from solution, M. Gernez disputes that observer's result in the experiment in which a small metallic cage with very close meshes is introduced into seltzer water. M. Gernez says that, varying the experiment in many ways, he has always found that the gaseous mass imprisoned in the cage increases at expense of the dissolved gas. In a few minutes it increases sufficiently for bubbles to be formed in the larger meshes, and one may even determine beforehand the points where gaseous liberation will take place, by enlarging certain meshes with the point of a needle.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, Feb. 17.—"On Experimental Contributions to the Theory of Electrolysis," by Alfred Tribe, Lecturer on Chemistry in Dulwich College. Communicated by J. H. Gladstone, Ph.D., Fullerian Professor of Chemistry in the Royal Institution.

Linnean Society, March 2.—Prof. G. J. Allman, president, in the chair.—Sir Victor A. Brooke, Bart., Mr. R. B. Croft, Dr. Ralph Gooding, Mr. F. J. Horniman, and Mr. W. Percy Sladen were elected Fellows of the Society.—Preceding the business routine, it was the painful duty of the President to announce the demise of John J. Bennett, F.R.S., who formerly, and for twenty years most creditably acted as secretary to the Linnean Society. Among his scientific labours the "Plantæ Javanicæ" worked out a then imperfectly-trodden field; his colleague in the said volume being Robt. Brown, *facile princeps botanicorum*. Mr. Bennett afterwards, and for years, was chief of the botanical department of the British Museum, retiring to Sussex, where he died. As a man he worked well, wisely, and energetically, and his name will always be remembered among botanists and friends as ripe in science, humanity, and fulness of heart. Another Foreign Member who has lately died, M. Adolphe T. Brongniart was among the most distinguished botanists of our age and a Fellow of the Society for upwards of forty years. His fame will rest on his "Végétaux Fossiles," wherein he may be said to have laid the foundation of fossil botany. He, moreover, wrote a vast number of other original and independent memoirs, and still found time for years to conduct as editor the botanical section of the *Annales des Science*, enriching the same with his great erudition.—J. Gwyn Jeffreys, F.R.S., exhibited on behalf of Sir James Anderson, a fine and interesting specimen of the so-called felt or blanket sponge, *Askonema setubalense*, Kent. This was picked up Aug. 24, 1875, along with the telegraph cable from a depth of 550 fathoms off Cape Finisterre.—Mr. C. Stewart called attention to peculiarities of the large rossette spicules found in its fluffy structure.—A mould of the upper surface of the cranium of the fossil *Ornithocheirus* and various fragments of the skeleton were exhibited and commented on by Prof. Seeley; these illustrating points raised in a former paper of his "On the Organisation of the Ornithosauria."—A paper was read on a new genus of Turneraceæ from Rodriguez, by I. B. Balfour, F.L.S. The tree in question is known to the inhabitants under the name of *Bois Gaudine*, and grows on the hilly parts of the island. It possesses a fine-grained, light-coloured wood, which, however, is not much used. The tree itself is handsome though small, being very erect in habit; its terminal branches are clothed with a light-green foliage. This new genus *Mathurina*, has close relationship to *Erblichia*, but differs manifestly from *Turnera* and *Wormskioldia*, its circumscribed habitat, moreover, lending additional interest. Mr. J. G. Baker, of Kew, in addition, stated that the botanical results of this Rodriguez Transit of Venus Expedition, through Mr. Balfour's collecting, had yielded some 280 species of flowering plants and ferns. Of these 110 were common weeds and 170 species indigenous to the island. The botany of Rodriguez, with a total area of fifteen miles, has now been fully settled by Mr. Balfour's researches, and these go to sustain its flora as belonging to the temperate region, and not truly tropical in character.—A paper on pollen was communicated by M. P. Edgewörth, F.L.S. The pollen grains of some 400 species have been carefully examined and drawn to scale by the author, those of the main orders of plants receiving comparison. It results from his survey that some families appear to have the bodies in question of variable forms, while others are remarkably uniform in shape.—Notes on algæ found at Kerguelen Land (by the Rev. A. E. Eaton), by Prof. Dickie, F.L.S. In this paper three new species, *Sphacelaria corymbosa*, *Melobesia kerguelini*, and *Ptilota eatoni* are described. The total number of algæ recorded are 65; of these 16 belong to the Olive, 34 to the Red, and 15 to the Green series. While there are 9 peculiar to the island, 21, or about one-third, are also found on European shores.—A list of the Musci and Hepaticæ collected in Kerguelen Island (by the Rev. A. E. Eaton), by William Mitten, F.L.S., was taken as read. This contains reference to 38 mosses and 13 liverworts, of the former, *Bartramia eatoni*, of the latter, *Tylimanthus viridis* and *Balantiopsis incrassata*, are new to science.—W. Carruthers, F.R.S., in calling attention to the specimens on the table, gave a *résumé* of the recent researches of Prof. De Bary of Strasbourg, into the potato fungus. The Peronosporeæ De Bary separates into three genera. In *Cystopus* the conidiophores grow in large bunches, the conidia, or bud-cells, being developed in single rows in basipetal order. In *Peronospora*, from a tree like mycelium, conidiophores arise singly or in small bunches at the end of the branches, and have no successors in the direct line. *Phytophthora* differs from the last in its multiple and successive conidia, which, when shed, leave swellings on the branches. The ripe conidia in all, when placed in water, produce zoospores, or nucleate moveable cells provided with cilia. These penetrate the plants, and, ceasing to move, develope threads, or mycelium. By another sexual method of propagation the oogonia, bladder-shaped female cells, after being fertilised by the small male cells, antheridia, produce from their protoplasm a thick-walled oospore. Mycelial threads sprout from this latter and the above process is repeated. A considerable period of inactivity may, however, precede the germination of the oospore, which in this case hybernates for the winter, whilst its host decays. The conidia, De Bary states, propagate and spread the fungus during the summer season only, but do not live through the winter. He has, moreover, found in decayed potato tubers bodies exactly corresponding to oospores. On experimenting with the oogonia of these and planting them in potatoes he obtained bodies which conducted themselves precisely like zoospores, and in most respects resembled those of *Pythium*. Other experiments with them, on the moistened legs of dead flies and bodies of mites, resulted in their complete phases of development, which was watched step by step, the zoospores producing a plentiful crop of mycelium, &c. As this new fungus in many ways differs from the *Phytophthora infestans*, he names it *Pythium vexans*, on account of his trouble therewith. He regards it as a true Saprolegniea. De Bary has likewise investigated the question of the perennial mycelium of *Phytophthora* occasionally discharging the function of hybernation where the oospores are not found in the district. He believes he has established by proofs that there are two methods whereby the conidia pass from the tuber to the foliage. The general opinions held in this country De Bary is at variance with. Mr. Worthington Smith replied at some length to Mr. Carruthers' epitome, and criticised De Bary's conclusions unsparingly. Dr. Masters supported Mr. Smith's views, as opposed to Prof. De Bary's interpretation of the subject at issue. Further discussion of this interesting topic was postponed till next meeting. A series of the said parasitic fungi prepared by De Bary were exhibited under the microscope to the Fellows present. His complete memoir hereafter is to appear in the Roy. Agric. Soc. Trans.

Chemical Society, March 16.—Prof. Abel, F.R.S., president, in the chair.—Before commencing the ordinary formal

business of the Society, Dr. J. H. Gladstone rose and in a short speech proposed a vote of thanks to the president for the exceedingly enjoyable visit to the Royal Arsenal at Woolwich on the preceding Tuesday, and for his generous hospitality on that occasion. This was seconded by Dr. Gilbert and carried by acclamation. The following papers were then read:—On crystallosed glycerin, by Dr. P. F. van Hamel Ross; notes on the fatty acids and on a suggested application of photography, by Mr. W. H. Hatcher.—On stibine, by Mr. F. Jones.—On the use of platinum in the ultimate analysis of carbon compounds, by Mr. F. Kopfer;—and on the action of organic acids and their anhydrides on the natural alkaloids, Part v., by Mr. G. H. Beckett and Dr. C. N. A. Wright.

Royal Astronomical Society, March 10.—Mr. Huggins, president, in the chair.—Since the last meeting the Society has received a valuable present of rare books from the library of the late Mr. Sheepshanks. Lord Lindsay has also presented the Society with the sun-spot manuscripts and observations of the late Mr. Carrington, a very valuable series, which has been made use of in determining the present received values of the elements of the position of the sun's axis and the drifts of the solar photosphere.—A paper by Dr. Royston Piggott was read on a star-illuminated transit eye-piece. A sheet of glass, on which a thin film of silver is deposited, is placed in the focus of the eye-lens; transparent lines are drawn on the film, instead of wires, and as the star passes across the lines it is seen to flash out brightly. The film of silver is made sufficiently thin to permit of the star being seen when it is between the lines, but it appears that the lines themselves are only visible, except in the case of very large stars, when the star disc is in transit across a line. Capt. Abney read a paper on photographing the least-refracted end of the solar spectrum. He said that within the last two years many attempts had been made to photograph the ultra-red rays. Dr. Vogel, in 1874, and more recently Capt. Waterhouse, had made use of aniline dyes in the collodion. They stated that with a red dye the collodion was found to be most sensitive to the red end of the spectrum. He had repeated these experiments, and had obtained only partial success; he had, however, from considering the chemistry of the question rather than the physical explanation which had been given and which he believed to be a mistake, been led to try other experiments as to mixing gum resins with the collodion, and had obtained a compound which was very sensitive to the long wave-lengths, so that he had been able to obtain distinct traces of the spectrum beyond A. He hoped to continue his experiments and to give a fuller account of them to the Society at a later meeting.—Two papers were read on the proper motion of the star B. A. C. 793. It appeared from the remarks of the Astronomer Royal and Mr. Dunkin that there is no sufficient evidence to prove that its proper motion has changed during the present century.—Capt. Noble drew attention to a paper by M. Normand on the occultation of stars by the planets as a means of determining the solar parallax. He wished the owners of large telescopes to determine with what degree of accuracy they could observe the occultation of minute stars at the limb of Mars.

Entomological Society, March 1.—Prof. Westwood, president, in the chair.—Dr. G. Kraatz, President of the German Entomological Society, Berlin, and Mr. Clemens Müller, of Berlin, were elected Foreign Members; and Mr. O. E. Jansen was elected an Ordinary Member.—Mr. Jenner Weir exhibited two grasshoppers, in an undeveloped state, taken by himself in the Rhone valley, *in copulâ*—a peculiarity which had frequently been observed among the Hemiptera. He also exhibited a remarkable moth from Madagascar belonging to the *Uraniidæ*, bearing a very striking resemblance to a *Papilio*, except that it had the antennæ of a moth, and the hind wings were destitute of tails.—Mr. E. Y. Western exhibited Coleoptera taken chiefly in Switzerland.—Mr. W. Arnold Lewis exhibited a specimen of *Argynnis Dia* taken in England by Mr. Wallace A. Smith. Mr. Smith, who was present at the meeting, stated in answer to various inquiries by the President, that he had taken the specimen in 1872 in Worcester Park, and distinctly remembered the capture, as it was the first fritillary he had ever had in his possession, and also that it had never been out of his possession since.—Mr. Bates read a paper from Mr. Trovey Blackmore to Mr. McLachlan stating that he was much interested in observing a notice in the Proceedings of the Society respecting the habits of *Cychrus cylindricollis*, reported by M. Baudi to feed on snails. He had already called attention (in the *Entomologist's Monthly Magazine*, vol. xi. p. 214) to the fact that the *Carabus stenocephalus*, Fairm., fed on snails, which in Morocco were so very abundant as to form a marked feature in the landscape by covering the bushes so thickly as to resemble, at a distance, clusters of blossom. He had captured in all eighteen specimens of this rare *Carabus*, and of these fifteen were obtained either feeding on snails or climbing up bushes of *Retama*, which were covered with snails, especially with *Helix planata*. The *Carabus* having an unusually long head, and the prothorax being narrowed anteriorly enabled it to thrust its head and prothorax a considerable distance into the shell in search of its food. Mr. Blackmore referred to some other North African species of *Carabi*, which he thought might be found to have similar habits to those of *C. stenocephalus*.—The President read a paper entitled "A Dipterological Note from Pompeii," containing remarks on the habits of the genus *Bombylius*. The President also presented descriptions of some new species of *Tipulidæ* in the British Museum, accompanied by drawings, showing them to be furnished with hind legs of unusual length.—Mr. John Scott contributed a monograph of the British species belonging to the *Hemiptera-Homoptera* (family *Psyllidæ*), together with a description of a genus which might be expected to occur in Britain.

Physical Society, March 11.—The president, Prof. G. C. Foster, F.R.S., in the chair.—The following candidates were elected members of the society:—W. H. Coffin, T. D. Humpidge, and Rev. G. H. Hopkins.—Prof. W. G. Adams gave an account of some researches on which he has been engaged in connection with the influence of light and heat on the electric conductivity of selenium, and exhibited numerous experiments in illustration. The subject has also been studied by Lieut. Sale and Dr. W. Siemens of Berlin, and as a general result it is found that after it has been kept in the dark, the resistance of the metal is diminished by exposure to light. The effect, however, both of heat and light, is different in the several states through which the metal passes. Thus when a piece of amorphous selenium is gradually heated to about 100° C. kept at this temperature and slowly cooled, its resistance at first is so great that it cannot be measured by the ordinary arrangement, but as its temperature increases, the resistance diminishes and increases again more slowly when the metal is allowed to cool. The resistance of several pieces which at the higher temperature were from one to three megohms were found to be from 100 to 130 at the ordinary temperature. If this selenium be placed in a paraffin bath and heated, its resistance diminishes, and when the temperature is kept constant above 140° C. for some hours and the metal is then slowly cooled, it assumes a crystalline structure, and its resistance *diminishes* as it cools. The resistance of such selenium at ordinary temperatures *increases* with the temperature. The effect is more marked as the temperature of the paraffin bath is increased. In studying the effect of light, the metal which had been heated to 140° C. was exposed to a candle at distances of 1, ½, and ¼ metre; the initial resistance being 115,500 ohms. The readings in these three cases were 112,000, 108,700, and 101,500. Deducting each from the initial number we have 3,500, 6,800, and 4,000 ohms as the changes of resistance due to exposure at these distances. Hence the effect of light varies inversely as the distance or, what amounts to the same thing, directly as the square root of the illuminating power. These considerations have led Prof. Adams to suggest the use of selenium for comparing the illuminating powers of different sources of light, and he exhibited the arrangement which he proposes to use for this purpose. The action of light of different degrees of refrangibility was then exhibited, by allowing the light from several parts of a spectrum of the electric lamp produced by a bisulphide of carbon prism to fall on the metal, the remainder being cut off by means of a screen, in which there was a narrow slit. The violet light gave a deflection of about two divisions on the screen, the greenish yellow four, the orange red five and a half, and the deep red nine divisions. The effects produced by the greenish yellow and the deep red are at times nearly equal. It may easily be shown by raising the temperature of the metal that the effect of light on its conductivity is essentially the same in kind at a low and moderately high temperature. The fact that light and not dark heat produces the observed effect has been shown by sending the beam through solutions of iodine in bisulphide of carbon. A very small effect on the metal was always observed, but this may be assumed to have been due to light, as in all cases it was possible to see the form of the carbon points through the solution. This fact may also be strikingly shown by exposing selenium through which a current is passing to the flame o.

a Bunsen burner, first, when in its ordinary condition, and afterwards with the air openings at the base closed. It was shown that, whereas in the first case the effect produced was equivalent to three divisions of the scale, in the latter case one-tenth of the current produced by the exposure deflects the needle to the end of the scale. Prof. Johnstone Stoney then explained the theory which he has suggested in explanation of the phenomena observed in the radiometers of Mr. Crookes, which has been published in the *Philosophical Magazine* for the current month. The theory rests on the supposition that there is an excessively small trace of residual gas in the sphere in which the moving discs are enclosed. When the apparatus is exposed to heat the blackened side of the disc is slightly warmed, and this warms a layer of air in contact with it. At the ordinary atmospheric pressure, Prof. Stoney assumes the layer so warmed to have the thickness of a sheet of paper, when the temperature of the disc is 20° C. above that of the surrounding air, and on such a supposition we may calculate it for any other pressure and temperature. If we diminish the pressure the thickness varies inversely as the pressure raised to the power $\frac{3}{4}$. Thus if the disc be raised $\frac{1}{10}$° C. above the surrounding air, and the exhaustion carried to the $\frac{1}{10000}$th of an atmosphere, the layer will have a thickness of more than a decimetre, and the effect of the air will then be peculiar. If the gas is of such a density that the glass envelope is beyond the range of this action, the gas beyond the limiting distance will be cold, but if the effect reach the glass, conduction will take place to it. There will then be a procession of warm molecules towards the glass, where they will be cooled down, and form a number of cold, slow-moving molecules, which will go back to the disc and beyond it. And these processions will be intermixed with molecules taking no part in the action. In consequence of this, very few members will travel far in their paths; a portion of the motion of each, however, will be carried forward in the right direction. So long as these processions go on, the slow-moving molecules which reach the front of the disc are thrown off more vigorously than from the back. Prof. Stoney considers the pressure thus produced to be that measured by Mr. Crookes. With a pressure of the gas of $\frac{1}{10000}$th of an atmosphere, an elevation of temperature of $\frac{1}{10}$° C. will produce the force actually observed, while if the exhaustion be carried to $\frac{1}{100000}$th the elevation of temperature necessary will be $\frac{3}{10}$° C. Thus with the greater pressure a lower temperature will suffice, but other influences will then be brought into play tending in an opposite direction. It was pointed out that on this theory the action may be considered as closely resembling electricity, and Mr. Crookes has shown that the glass envelope is often itself slightly electrified.

PARIS

Academy of Sciences, March 13.—Vice-Admiral Paris in the chair.—The following papers were read:—Observations of the moon made with meridian instruments of the Paris Observatory during 1875, by M. Leverrier.—Second note on the transformation of nautical astronomy, through the progress of chronometry, by M. Yvon Villarceau.—Observations of temperature at the Museum during 1875, with electric thermometers placed at depths of 1 to 36 metres in the ground; and *résumé* of ten years' observations, by MM. Becquerel. This *résumé* shows that the mean annual temperatures of the ten years increase regularly from 1 to 36 metres, at the rate of about one degree per 30 or 31 metres difference of level. An aquiferous sheet of 26 metres gave a slight excess of temperature. At 36 metres the temperature was constant and equal to 12°·42 (mean temperature at 1 metre = 11°·31).—On the siliciuration of platinum and of some other metals, by M. Boussingault.—On the flood of the Seine in February and March 1876, by M. Belgrand.—Observations on M. Resal's recent communication on steam-jacketing of engine cylinders, by M. Ledieu.—Note on water-pipes, by M. Boileau.—On the linear equations of the second order, of which the integrals are algebraic, by M. Jordan.—On the transit of Venus of Dec. 9, 1874, by M. André. The diameter of a star (of sufficient brightness) varies with the aperture of the instrument with which it is observed; the author verified this experimentally, and he draws some inferences relative to the transit observations.—On the eggs of Phylloxeras, by M. Lichtenstein.—On a process of direct application of sulphide of carbon in the treatment of phylloxerised vines, by M. Allies.—Treatment of phylloxerised vines with sulphide of carbon introduced and diffused in the soil by means of an aspirating apparatus, by MM. Crolas and Jobart. An iron tube, with terminal apertures, is inserted in the ground; air is drawn off through it by a pump, while sulphide of carbon is sprinkled over the surface; thus the vapour penetrates the soil. The cost is 320 francs per hectare.—On the employment of potash and of lime in treatment of the vine, by M. Demaille.—On the overthrow of the Grand-Sable at Salazie, by M. Vélain. The case was strictly analogous to that of landslips in Switzerland (not a volcanic phenomenon).—On a means of preservation against the accidents caused by fire-damp in mines, by M. Minary. The gas, being lighter than air, ascends, and M. Minary would make a series of vertical excavations in the roof to receive it, the apertures merely allowing the gas to enter and the air to escape. The collected gas could be drawn off to the surface by pipes. Should the gas in these reservoirs be largely mixed with air, he would place in them a system of porous tubes to separate it by endosmose, and these would be connected with the suction pipe.—Letter from M. Peters on the discovery of the planet (160) communicated by M. Le Verrier.—Observation of the planet (160) made with the garden equatorial, by MM. Henry.—Observations of same planet at the Observatory of Marseilles, by M. Borrelly.—On the approaching return to perihelion of the periodic comet of D'Arrest, by M. Leveau.—On polar auroras, by M. Planté. When the positive electrode of a strong secondary battery is brought towards the liquid surface of a vessel of salt water in which the negative electrode dips, you observe, according to its distance from the liquid, a corona of luminous particles round the electrode, or an arc bordered with a fringe of bright rays, or a sinuous line which rapidly bends to and fro on itself; the latter being especially similar to what one observes in auroras (like the undulation of drapery moved by the wind). Purple and violet tints appear as well as yellow. The liquid is greatly agitated, and steam rises more abundantly the further the electrode penetrates. Sound and magnetic perturbations are had, like those accompanying auroras. The negative electrode did not give the above phenomena, and auroras are probably due to a flow of positive electricity. Probably the imperfect vacuum in the upper regions plays the part corresponding to the negative electrode in the experiments, and the electricity comes from tropical regions.—Source of carbonic oxide, characteristics of formines, and of polyatomic alcohols, by M. Lorin.—On the canga of Brazil, and on the basin of fresh water at Fonseca, by M. Gorceix. Canga is a ferruginous conglomerate formed (according to the author) from *débris* of itabirites carried down by water, and cemented by ferruginous water.—On the causes which have brought about the retreat of glaciers in the Alps, by M. Gruner. From meteorological observations at St. Bernard, he finds that the period 1861-74, compared with the previous twenty years, shows an increase of mean temperature of 0°·92, a diminution of water of 0·204m., and, especially, a reduction of one-half in the falls of snow, 4·846m. instead of 10m. At Geneva, a similar change has been perceptible.—M. Cagnant called attention to a bed of kaolin at Saint Beaudelle, in the department of Mayenne. It would be well suited for manufacture of sulphate of alumina, which could be used for clarifying the Paris sewage water.

CONTENTS