Central Board at their half-yearly meeting in April next. "That Clause 1 (2) of the Bill should be amended by omitting the words 'one other person,' in order to insert the words 'two other persons, one of whom shall be a person well acquainted with the conditions of Wales and the wants of the people.'" "That considerable difficulty might arise in the future from the apparently concurrent jurisdiction of the Board of Education and the Charity Commission foreshadowed in Clause 2 (2) and (3), and that it is important therefore that the Bill should be so amended as to provide for a completer fusion of these two bodies." "That the Bill should be so amended as to indicate clearly that there will be no interference with the present organisation of intermediate and technical education in Wales and Monmouthshire under the Welsh Act, and that provision should be made for preserving to the Central Welsh Board the functions exercised by it under its scheme, and under the Treasury regulations already in force, for the inspection and examination of schools in the Principality." "That the Central Welsh Board might properly be regarded as a Consultative Committee, to which matters specially connected with Welsh education might be referred by the Board of Education for consideration and report."

SCIENTIFIC SERIALS.

American Journal of Science, December.—Another episode in the history of Niagara Falls, by J. W. Spencer. The first episode of the river was characterised by a cascade comparable in size to the American Falls, draining the Erie basin alone. The commencement of the second episode was marked by an increase in the volume of water, owing to the drainage of all the upper lakes being turned into the Niagara. Subsequently the fall was increased from 200 to 420 feet. Instead of continuing until reduced to its present height of 326 feet, the author now believes that it was reduced to a lower amount, 250 feet, and subsequently increased. This additional episode accounts more fully for the narrows of the gauge than any previous explanation. The age of the Falls will probably come out a little different from 32,000 years, but their fate will be the same. They will disappear by the lakes being drained into the Mississippi basin by way of Chicago.—An apparatus for measuring very high pressures, by A. de Forest Palmer, jun. The pressure in a Bessemer steel cylinder filled with heavy oil compressed by a tinned-steel screw is measured by a thread of mercury in a capillary tube whose resistance alters with the pressure in a manner previously determined by the author. Pressures upwards of 4000 atmospheres may be thus measured.—The application of iodine in the analysis of alkalies and acids, by C. F. Walker and D. H. M. Gillespie. The reaction between iodine and hydroxides of the alkalies and alkaline earths in hot solution is regular and complete under analytical conditions, not being appreciably affected by the mass action of considerable excesses of iodine. The reaction is best applied in analysis by titrating the alkali with an excess of iodine, removing this excess by boiling, and estimating the iodine in the residue.—Some new tertiary horizons discovered near Punta Arenas, Chile, by A. E. Ortmann. These beds, examined by Mr. J. B. Hatcher, represent two new horizons different from and older than the tertiary beds known as Patagonian, containing a marine fauna completely new to science.—A biotite-tinguaite dike from Manchester-by-the-Sea, Essex Co., Mass., by A. S. Eakle. This dike cuts through the augite-syenite of Gales rock near Manchester. It is six inches wide, and exposed for twenty feet. It is very difficult of access, and is only exposed at low water. The rock has a greenish-grey colour and a slightly greasy lustre, like tinguaites and rocks rich in nepheline. Small phenocrysts of felspar are visible in the somewhat compact ground mass, and also much magnetite, mixed with biotite, occurs in brownish-black patches, giving the rock a mottled appearance.

Wiedemann's Annalen der Physik und Chemie, No. 12.—Genesis of the electric spark, by B. Walter. The author mounts a long sensitive plate on a little car moving on rails and driven by a falling weight. The discharge from an induction coil is so timed that at least two sparks are recorded. The negatives show that each spark consists of several successive discharges in the same direction, at intervals of $2\cdot7 \times 10^{-4}$ secs. The spark is invariably preceded by brush discharges, and in places where the spark is bent, a small brush-like appendage appears, showing that the spark changed its direction in consequence of too large a resistance.—Genesis of the point discharge, by E. Warburg. When a needle-point is mounted in the centre of a metallic sphere and charged to a certain minimum potential, a continuous discharge passes from the point to the sphere. The author finds that the discharge sets in about 0·007 seconds after the potential has attained the proper value.—Properties of the stratified brush discharge in the open air, by M. Toepler. When the current intensity of an influence machine discharge is raised from zero to a high value, the discharge, at first an ordinary brush discharge, takes the form of sparks, and is eventually converted into a stratified "brush light arc," showing white kathode light, scarlet positive light, and anode glow. This is another proof of the essential identity of open-air and vacuum discharges. If the gap is very small, only the spark discharge can be produced.—Tuning-plates as a substitute for tuning-forks at high pitches, by F. Melde. Small square Chladni plates, say 5 cm. wide and 0·5 cm. thick, give high notes whose pitches can be safely calculated from their dimensions. They can also be experimentally determined by the author's resonance method, being made to transfer their vibrations to a rod whose length is adjusted until distinct nodes are formed, made visible by sound. Notes of pitches up to 30,000, and quite inaudible to most ears, can thus be produced and studied.

The Quarterly Journal of Microscopical Science (November) contains papers on the development of the pig during the first ten days, the structure of the mammalian gastric glands, certain green (chlorophylloid) pigments in invertebrates, a larva in the metanauplius stage, and the nephridia of the Polychæta (Part ii.).

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 19.—"'Nitragin' and the Nodules of Leguminous Plants." By Maria Dawson, B.Sc. (London and Wales.) Communicated by Prof. H. Marshall Ward, F.R.S.

A study of the nodules found upon the roots of leguminous plants has led the author to an unhesitating confirmation of the parasitic nature of both the filaments and the bacteroids contained in these organs. The filaments, it was found, have no such constant relation to the nucleus of the cells, as was represented by Beyerinck in 1888. By plasmolysis of the root-hairs, the infection tube is shown to have grown into the hair, and not to correspond with the primordial utricle of the hair, a result which proves that Frank was mistaken in regarding the tube as formed from the contents of the hair mingled with fungal protoplasm. By staining with aniline blue and orseillin these tubes and the filaments in the cells were shown to consist of strands of straight rodlets, lying parallel to the longer axis of the filament, and embedded in a colourless matrix. This matrix does not consist of cellulose, chitin, or any form of mucilage. The swellings upon the filaments occur at places where the rodlets have become heaped up, and at such places the filaments eventually burst, liberating the rodlets, whilst they themselves remain as pointed portions, directed towards each other in the cells. After liberation from the filaments, the rodlets become transformed into X, V, and Y-shaped bacteroids. This variety of shape does not occur when these organisms are cultivated outside the plant on a solid medium, but in liquid pea extract, the change from straight rodlets to "bacteroids" occurs in a few days. By cultivating these organisms in drop cultures under constant observation with high powers, these rodlets are seen to multiply by division into equal, or sometimes slightly unequal, halves. By this method the author hopes also to determine whether the change in shape arises from fusion of two or more individuals or by branching. Their multiplication by division leads to the conclusion that these organisms are members of the Schizomycetes; whether or not they are true bacteria must, however, still be undecided until the final stage in their life-history has been fully followed.

The X, V, or Y-shaped bacteroid, when once formed appears to be incapable of further growth. These organisms are aërobic in character, their power of fixing atmospheric nitrogen is to be tested in connection with their growth on silicic acid gelatin.

Commercial "Nitragin" consists of minute micrococcus-like bodies, all straight and immobile. They multiply rapidly on gelatin media, and in pea extract become converted into "bacteroids" as well as straight rods. Nitragin does consist of the tubercle organism, and as a result of the inoculation of either seeds or soil with it, tubercle formation takes place. Crossing of kinds supplied for different genera and species is quite successful within the tribe Vicieæ. In order to test the possibility and conditions of direct infection of the roots, seedling peas, starting both before and after germination, were grown in sterile tubes, by which means the whole plant was kept under control. This method showed that direct infection of quite young radicles is tolerably certain, also of older roots, provided the conditions under which germination occurred are maintained after infection.

In order to secure infection it is not necessary that the organism should pass through the soil, and the age of the root-hair at the time of infection seems to be without effect upon the result. An accumulation of CO_2 round the roots is not the cause of failure in direct infection.

The addition of nitragin to soils rich in nitrates appears to be inadvisable, but a supply of it to soil poor in nitrates results in an increased yield, though better results are obtained if instead of nitragin, nitrates be added to the soil.

Royal Meteorological Society, December 21.—Mr. F. C. Bayard, President, in the chair.—Captain A. Carpenter, R.N., gave an account of the hurricane which caused so much devastation in the West Indies in September last. The cyclone, passing eighteen miles south of Barbados, swept over the southern half of St. Vincent Island, then took a north-west direction towards Aves Island, its rate of progression being about seven and a half miles per hour. From here it pursued a northerly course for 450 miles, passing between Puerto Rico and the Windward Islands. It then swerved to the north-west for 600 miles, when it re-curved to the north-east. Its diameter was eighty miles as it approached Barbados, and 170 miles after leaving St. Vincent. The actual storm-centre (in which the force of the wind greatly increased) was only thirty-five miles in diameter until St. Vincent was passed, but after that the strength of the wind extended to 170 miles from its centre. The diameter of the calm vortex, or "eye" of the storm, was not less than four miles. The storm was accompanied by very heavy rainfall, the amount at St. Vincent being about 14 inches in the twenty-four hours ending at 9 a.m. on the 12th. The barometer at the Botanic Gardens, Kingstown, on the 11th, fell from 29·539 inches at 10 a.m., to 28·509 inches at 11.40 a.m., a fall of 1·03 inches in 1 hour 40 minutes. In Barbados 11,400 houses were swept away or blown down, and 115 lives were lost; and in St. Vincent 6000 houses were blown down or damaged beyond repair, and 200 lives lost.—Mr. W. H. Dines read a paper on the connection between the winter temperature and the height of the barometer in North-western Europe. From an examination of the records of the barometer and temperature at several observatories, extending over many years, the author is of opinion that the winter temperature at a place in Western Europe has no connection with the height of the barometer at that place, and that in winter it is just as likely to be cold when the barometer is below the average, as when it is above the average.

MANCHESTER.

Literary and Philosophical Society, December 13.—Mr. J. Cosmo Melvill, President, in the chair.—Dr. G. H. Broadbent described some microscopical observations he had recently made in the development of a Rotifer (*Philodina microps*) obtained from an infusion of bicycle mud. Two days after the organism was found the ovum was extruded, and was under observation for two days, when it was lost. On the following day another ovum was discovered, and the stages of development were observed day and night (with only seven hours' intermission) for four days, at the end of which period the organism emerged from the ovum fully formed.—Description of a new genus and species of Hymenoptera (*Liaba balteata*) from Chili, by Peter Cameron. The description is based on a single male specimen, which is undoubtedly closely allied to the genus *Nomadina* of the family *Trigonalidae*. This family the author proposes to dlvide into two tribes, *Trigonalinae* and *Nomadinae*, the former containing the genus *Trigonalis*, and the latter the genera *Nomadina* and *Liaba*.—Vestiges of primitive man found near Todmorden, by Dr. J. Lawson Russell. In July last the excavation of a curious "ring barrow" at Blackheath, near Todmorden, Yorkshire, was undertaken by Alderman Crossley and Messrs. Wilkinson and Lowe, of Todmorden, which resulted in the finding of the remains of several cinerary urns. The work of excavation was continued in November by Dr. Russell, who found a number of other urns, four of which, together with the various objects found with them—bone pins, a bronze knife, whetstones, beads of resin, lignite, pot and bone, and also several small vessels enclosed in the urns, of the kind usually known as "incense pots"—have been carefully restored by Messrs. Standen and Hardy, of the Manchester Museum. The urns, which were exhibited at the meeting, are all of different patterns and variously ornamented. The paper was illustrated by about fifty lantern slides prepared from photographs mostly taken on the spot, and showing the position of the urns *in situ* prior to removal, the disposition in the circle of the various objects found, and other features of interest.

EDINBURGH.

Mathematical Society, December 9.—Dr. Morgan, President, in the chair.—The following papers were read:—Systems of circles analogous to Tucker circles, part ii., by Mr. J. A. Third; Cantor's history of Mathematics, vol. iii. part iii. (concluding): a review with special reference to the *Analyst* controversy, by Prof. G. A. Gibson.

PARIS.

Academy of Sciences, December 19.—M. Wolf in the chair.—The President delivered his annual address, and gave a short account of the work of the Correspondants and Associates deceased during the past year. The prizes for the year 1898 were awarded as follows: the Grand Prize of the Mathematical Sciences to M. Émile Borel for his memoir on the part played in analysis by divergent series, M. Maurice Servant being awarded an honourable mention. The Bordin Prize was not awarded; the Francœur Prize was awarded to M. Vaschy, and the Poncelet Prize to M. Hadamard. In Mechanics, the Extraordinary Prize of 6000 francs was divided between MM. Baude, Charpy, Thiébaut, Ravier, and Moissenet; the Montyon Prize awarded to M. de Mas for his researches on the resistance of water to moving boats; a Fourneyron Prize to M. Bourlet, another being divided between MM. Carvallo and Jacob, and an honourable mention to Mr. Sharp. In Astronomy, the Lalande Prize is given to Dr. S. C. Chandler for his researches on the variation of latitude and on variable stars, M. Chofardet receiving an encouragement; the Damoiseau Prize is given to Prof. George Williams Hill for his numerous astronomical memoirs, the Valz Prize to M. P. Colin, and the Janssen Prize to M. Belopolsky. In Statistics, the Montyon Prize is awarded to M. Alfred des Cilleuls, M. Martial Hublé receiving a very honourable mention, and M. Paul Vincey an honourable mention. In Chemistry, the Jecker Prize is divided between MM. G. Bertrand, Buisine and Daniel Berthelot, Dr. C. A. Schott receiving the Wilde Prize. In Mineralogy and Geology, the Vaillant Prize is awarded to M. Cayeaux; and in Botany, the Desmazières Prize to M. G. Battista de Toni, the Montagne and La Fons-Melicocq Prizes not being awarded; but M. le general Paris and Dr. Ledoux-Lebard receive encouragements. In Anatomy and Zoology, the Thore Prize is given to M. Pantel for his contributions to the knowledge of parasitic organisms and their relations with the host, and the Savigny Prize to M. Courtière for his researches on the marine fauna of the east coast of Africa. In Medicine and Surgery, Montyon Prizes are received by MM. Widal, Sëcard, Bard, Poncet and Bérard. Mentions are given to MM. Le Double, Variot, and Kirmisson, the Barbier Prize being given to Dr. J. Comby, the Bréant Prize to M. Phisalix, the Bellion Prize to M. Castaing, and the Baron Larrey Prize to MM. Regnault and de Raoult. The Godard Prize is divided between MM. Motz and Guiard, the Mège Prize between MM. Labadie-Lagrave and Félix Legueq, and the Lallemand Prize between Mr. E. P. Allis and M. Thomas. In Physiology, the Montyon Prize for experimental physiology is awarded to M. Tissot, honourable mentions being accorded to MM. Dassonville, Lesbre, Reynaud and Mlle. Pompilian, the Pourat Prize to MM. Courtade and Guyon, and the Philipeaux Prize to M. Moussu. In Physical

Geography, the Gay Prize is given to M. Sauvageau. Of the general prizes, the Leconte Prize is not awarded this year, M. Fremont receiving the Montyon Prize (unhealthy trades), Mme. Curie the Gegner Prize, M. Émilio Damour the Delalande-Guérineau Prize, M. Chaffanjon the Tchihatchef Prize, M. Êdouard Branly the Houllevigue Prize, M. Félix Bernard the Saintour Prize, M. Munier-Chalmas the Estrade-Delchos Prize, and M. Mérigeault the Laplace Prize. The following prizes are divided: the Jérome-Ponti Prize between MM. Guichard and Lemoult, the Cahours Prize between MM. Hébert, Metzner, and Thomas; M. Blanc receiving an encouragement, and the Kastner-Boursault Prize between MM. André Blondel and Paul Dubois and M. Paul Janet. The Rivot Prize is awarded to MM. Mérigeault, Defline, Le Troquer, and Gérin.

AMSTERDAM.

Royal Academy of Sciences, November 26.—Prof. Van de Sande Bakhuyzen in the chair.—Prof. Beÿerinck, on a contagium vivum fluidum, causing the spot-disease of tobacco leaves. This disease, also known as the mosaic disease of tobacco leaves, may be inoculated into healthy plants by injecting into the stem, near a bud, sap pressed from infected plants. The active virus passes completely through the pores of very dense porcelain, and can even penetrate into agar by diffusion; therefore it cannot be a contagium fixum in the usual sense, but it must be fluid. Out of the tobacco plant it cannot be made to multiply; but in the dividing tissues of the leaf-rudiments and the meristems of the buds it multiplies freely and over a great extent. A very small drop of the porcelain filtrate can render all the leaves of the infected plant entirely covered with spots, and the sap of these leaves would be sufficient for the contagion of an unlimited number of healthy plants. The virus is destroyed by boiling at so low a degree as 90° C.—Prof. Bakhuis Roozeboom, on the phenomena to be observed on the solidification of liquids, consisting of two tautomeric forms. In the case of equilibrium being established between these forms at the temperature of solidification, these phenomena have been treated by Bancroft. A new deduction was given for those cases in which solidification takes place at temperatures at which no equilibrium can be established any more in the liquid, and specially when supposing that one passes from the region of equilibrium through two regions of one-sided equilibrium to the region of non-equilibrium. All the various consequences of slow and quick heating and cooling may be graphically represented.—Prof. Van der Waals deduced from the phase equation for a mixture, given by himself, the laws for Δ_v (the volume contraction on mixing under constant pressure) and Δ_p (the pressure contraction on mixing in given volume), and compared the results, obtained by himself, with the observations of Kuenen and others in the case of mixtures of carbonic acid and methyl chloride. According to Amagat, Δ_v would be $=0$, and according to Dalton's law, $\Delta_p=0$. The results, arrived at by the author, may briefly be summed up as follows: Δ_v is small all along the course of the isotherm, and the amount may be considered a magnitude of the same order. On the other hand, Δ_p follows a course equal to the deviation from Boyle's law, and when the volume is small it approximates infinity.—Prof. Van Bemmelen presented for publication in the *Proceedings* a communication by Mr. F. A. H. Schreinemakers, entitled, "Equilibriums in systems of three components, variation of the temperature of solution of binary mixtures by the addition of a third component."—Prof. Van der Waals, on the errors that may be committed in the determination of the molecular weight from the vapour density in consequence of the deviations from Boyle's and Guy-Lussac's laws.

DIARY OF SOCIETIES.

MONDAY, JANUARY 2.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—On Safety Explosives: Oscar Guttmann.

VICTORIA INSTITUTE, at 4.30.—The Physiography of the Thames Basin: Prof. Lobley.

WEDNESDAY, JANUARY 4.

GEOLOGICAL SOCIETY, at 8.—Geology of the Ashbourne and Buxton Branch of the London and North-Western Railway. Part I. Ashbourne to Crakelow: H. H. Arnold-Bemrose.—The Oceanic Deposits of Trinidad, W.I.: J. B. Harrison and A. J. Jukes-Browne.

SOCIETY OF ARTS, at 7.—Hands and Feet: Prof. F. Jeffrey Bell.

FRIDAY, JANUARY 6.

GEOLOGISTS' ASSOCIATION, at 8.—The Glaciers and Fjords of the Bergen District, Norway: Horace W. Monckton.

QUEKETT MICROSCOPICAL CLUB, at 8.

BOOKS RECEIVED.

BOOKS.—Das Kleinebuch von der Marine: G. Neudec and H. Schröder (Kiel, Lipsius).—The New Gulliver: W. P. Garrison (N.Y., Marion Press).—Practical Photographer, Vol. ix. (Lund).—Die Kalturgewächse der Deutschen Kolonien und ihre Erzeunisse: Prof. R. Sadebeck (Jena, Fischer).—Das Geotektonische Problem der Glarner Alpen: A. Rothpletz, Text and Atlas (Jena, Fischer).—Studien über Säugethiere: Dr. Max Weber, Zweiter Theil (Jena, Fischer).—Sewerage: A. P. Folwell (N.Y., Wiley).—A Text-Book of Physiological Chemistry: Prof. O. Hammersten, translated by Prof. J. A. Mandel, 2nd edition (N.Y., Wiley).—Annals of Coal Mining: R. L. Galloway (*Colliery Guardian* Office).—Fossil Medusæ: C. D. Walcott (Washington).—On the Study and Difficulties of Mathematics: A. de Morgan, new edition (Chicago, Open Court Publishing Company).—Truth and Error: J. W. Powell (Chicago, Open Court Publishing Company).—Lectures on Elementary Mathematics: J. L. Lagrange, translated by T. J. McCormack (Chicago, Open Court Publishing Company).—The Fishes of North and Middle America: Drs. Jordan and Evermann, Part 2 (Washington).

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