

noticed. The "notes" say that in a discussion on the paper, Mr. C. S. Peirce proposed that the term "Galileo" be applied to the unit of acceleration in the C.G.S. system. We also find in them an account of the proceedings at the centenary celebration of the birth of Lobachevsky by the Physico-Mathematical Society of the University of Kazán. Further we learn that Lambert's essay (*cf.* our notice of the *Bulletin* for December 1893) is to be incorporated in a volume entitled "Die Theorie du Parallellinien" (Teubner, of Leipzig), to be edited by Drs. P. Stoeckel and F. Engel. The prime factor will be the "first book of the marvellous work by Saccheri, 'Euclid vindicated from every fleck,' in which (in 1733) the two hypotheses which, besides Euclid's, are possible are developed, and all the results obtained which have been ascribed to Legendre. There is a list of new publications in higher and applied mathematics.

*Wiedemann's Annalen der Physik und Chemie*, No. 7.—Further electro-optical experiments, by J. Elster and H. Geitel. The capacity of thin layers of sodium, potassium, and rubidium applied to the walls of vacuum tubes of promoting the passage of a current when illuminated differs for different colours. For long waves, rubidium is the most, and potassium the least sensitive. If the layers are illuminated by polarised light the current intensity is greatest when the plane of polarisation is perpendicular to the plane of incidence. Electric oscillations of small period can be transferred to rarefied gas by illumination in presence of an alkali metal.—A new phenomenon attending the passage of electricity through badly conducting liquids, by O. Lehmann. This is a description of the formation of halos round the electrodes in a solution of pigments in water thickened with gelatine, sugar, or glycerine. Considerable disturbance is produced where the different coloured halos meet, while the rest of the solution remains undisturbed.—Experiments with Tesla currents, by F. Himstedt. The author gives an account of methods by which Tesla's experiments can be repeated with ordinary laboratory apparatus. High potential and rapid oscillations were produced by a Lecher wire combination used for producing Hertz oscillations.—On the demonstration of Hertz's experiments, by P. Drude. The author avoids the necessity of a high tension accumulator, as used by Zehnder, by allowing the sparks of the resonator to discharge an electro-scope charged by a dry pile. The point behind the concave mirror is put to earth; also one pole of the dry pile, the other pole being connected with the electro-scope and the sphere behind the mirror. When sparks pass, the leaves of the electro-scope collapse partly or totally. This may be shown to a large audience by projecting an image of the electro-scope on to a screen.—The change of phase of light by reflexion at thin films, by W. Wernicke. Under the name of "optical phase analysis" the author describes a method of detecting exceedingly minute impurities on the surface of polished glass or glass covered with a thin layer of gelatine. The influence of the play of cohesive force upon free molecules as regards their optical properties is investigated for pigments and the metals, with especial reference to silver.

## SOCIETIES AND ACADEMIES.

### LONDON.

Royal Society, February 8.—"Thermoelectric Properties of Salt Solutions." By George Frederick Emery, late Scholar of Trinity College, Cambridge.

In a circuit formed by a metallic wire and a solution an electromotive force is developed proportionately to the difference of temperature between the junctions. The solution to be examined is put in a U-tube with an electrode and thermometer in each limb, round one of which is a hot water-jacket.  $\delta$  is  $\equiv$  E.M.F. per  $1^\circ$  C., unit  $\delta$  being  $10^{-4}$  volt. Experiments were made with acetate chloride and sulphate of zinc, and sulphate nitrate and acetate of copper.  $\delta$  varied considerably with concentration. The value for pure water appears to be about 8.6, but cannot be measured directly; for some salts  $\delta$  increases with concentration, for others it diminishes. In all cases examined the current would go from hot to cold through the solutions. With zinc salts amalgamated zinc electrodes were used; with the copper salts the electrode used was a fine wire projecting from the end of a drawn-out glass tube. Values of  $\delta$  for mixed salts

seemed to show that differences from the water value are qualitatively but not quantitatively additive. Thus  $\delta$ , starting from about 8.6, tends for moderate concentrations to a nearly constant value for each salt. M. Bouty, with very strong solutions of zinc chloride, found that  $\delta$  rapidly diminished, whence the entire curve for all concentrations between zinc chloride and pure water would have a point of inflexion. If, keeping the salt a fixed quantity, we use mixtures of two solvents, we get a complete curve for  $\delta$ . Experiments on 1 per cent. of cadmium bromide gave good results with all solvents used; with mixtures of methyl alcohol and water with alcohol, it gave the following values:—

Methyl alcohol per cent.	$\delta$	Water per cent.	$\delta$
100.0 ... ..	11.3	100.0 ... ..	7.0
90.0 ... ..	11.0	98.9 ... ..	6.86
81.3 ... ..	10.76	90.0 ... ..	5.83
70.0 ... ..	10.4	75.0 ... ..	5.053
50.0 ... ..	10.27	50.0 ... ..	4.075
30.0 ... ..	9.86	25.0 ... ..	4.123
18.7 ... ..	9.64	0 ... ..	8.15
10.0 ... ..	8.9		
0 ... ..	8.15		

In the first we have an inflected curve never far from the mean, in the second a small admixture causes a large drop in  $\delta$ . These two pairs of solvents represent two classes. The alcohols mix quietly without chemical action, while alcohol and water mix with evolution of heat, and change in bulk.

A few experiments, believed to be entirely novel, were made on the E.M.F. in a circuit composed of two kinds of liquid with junctions at different temperatures. Zinc sulphate 4 per cent. and weak zinc chloride gave  $E/(t' - t) = 1.36 \times 10^{-4}$  V.

Zinc acetate and zinc sulphate gave  $E/t' - t = 0.8 \times 10^{-4}$  V,  $1.05 \times 10^{-4}$  V,  $1.13 \times 10^{-4}$  V, mean value  $= 1 \times 10^{-4}$  V.

Lastly, measurements of the Peltier effect at a metal-liquid junction were made with various apparatus with fairly consistent results.

For 15 per cent. copper sulphate and copper, different measurements gave the heat evolved per unit  $\equiv H = 0.1992$ ,  $0.1927$ ,  $0.1956$ ,  $0.2078$ ,  $0.2091$ ,  $0.1952$ .

The last and best gives  $H/T = 6.83 \times 10^{-4} = \delta$  for the solution. Cupric nitrate with  $\delta = 6.14$  gave  $H = 0.1764$ ,  $H/T = 6.1$ . Thus these thermoelectric effects are of a reversible nature.

May 10.—"The total eclipse of April 16-17, 1893. Report of results obtained with the slit spectroscopes." By Captain E. H. Hills, R.E.

This paper deals with the results obtained from the photographs of the spectrum of the eclipsed sun taken in Brazil and Africa at the total eclipse of April 1893. The instruments employed, of which there were four, were slit spectroscopes of the ordinary type, and were each arranged to take one photograph during totality. Of the four resulting photographs two were partially unsuccessful and were not measured. The two others each show a strong prominence spectrum, and on both sides of this a continuous coronal spectrum, in which latter are seen a number of very faint lines. The wave-lengths of these lines were determined by using the known lines in the prominence spectrum as reference points, and from these constructing an interpolation curve. The coronal lines, whose wave-lengths were thus fixed, were, in almost all cases, apparently identical with lines which had been observed at previous eclipses, instruments of a similar type having been employed at the eclipses of 1882, 1883, and 1886.

The prominence spectrum, as shown on the photographs, extends from w.l. 3667 to w.l. 5316. It is chiefly remarkable for the extended hydrogen series, there being eight lines beyond the one at w.l. 3699, the wave-lengths of which are given as 3692.5, 3687, 3682, 3678, 3675, 3672, 3669.5, 3667.

"Researches on Modern Explosives" (preliminary communication). By William Macnab and E. Ristori.

A series of experiments with explosive compounds has been undertaken by the authors for the purpose of studying chemical reactions at high temperatures and pressures, and of elucidating certain thermal constants relating chiefly to the specific heat of gases under such conditions. Nitroglycerin, nitrocellulose, and several combinations of these two bodies, which are used as smokeless powders, have been chiefly employed in these experiments. The results given in this communication relate princi-

pally to the amounts of heat evolved by explosion in a closed vessel, and the quantity and composition of the gases produced. The following table contains the results of some of the experiments:—

being aggregated about the dividing nuclei in spherical masses. Resulting apparently from this division, flagellated swarm cells, having a diameter of 3-4  $\mu$ , are produced, which escape, leaving an empty shell.

Table Indicating the Quantity of Heat, also the Volume and Analysis of the Gas developed per gram with Nitro-glycerin, Nitro-cellulose, and with several different Combinations of these two Explosives made at Ardeer Factory.

Composition of explosive.	Calories per gram.	Permanent gas.	Aqueous vapour.	Total volume of gas calculated at 0° and 76 mm.	Per cent. composition of permanent gases.						Coeff. cent of potential energy.
					CO <sub>2</sub>	CO	CH <sub>4</sub>	O	H	N	
A. Nitro-glycerin .....	1652	c.c. per gram. 464	c.c. per gram. 257	c.c. per gram. 741	63.0	—	—	4.0	—	33.0	1224
B. Nitro-cellulose (nitrogen = 13.30 per cent.)	1061	673	203	876	22.3	45.5	0.5	—	14.9	16.9	929
C. { 50 per cent. nitro-cellulose (N = 12.24 per cent.)	1349	568	249	817	36.5	32.5	0.2	—	8.4	22.4	1102
50 per cent. nitro-glycerin .....											
D. { 50 per cent. nitro-cellulose (N = 13.3 per cent.)	1410	550	247	797	41.8	27.5	0.0	—	6.0	24.7	1124
50 per cent. nitro-glycerin .....											
E. { 80 per cent. nitro-cellulose (N = 12.24 per cent.)	1062	675	226	901	21.7	45.4	0.1	—	15.7	17.1	957
20 per cent. nitro-glycerin .....											
F. { 80 per cent. nitro-cellulose (N = 13.30 per cent.)	1159	637	227	864	26.6	40.8	0.1	—	12.0	20.5	1001
20 per cent. nitro-glycerin .....											
G. { 35 per cent. nitro-cellulose (N = 13.30 per cent.)	1280	627	236	863	26.7	39.8	0.5	—	12.8	20.2	1105
5 per cent. vaseline .....											
60 " " nitro-glycerin											

Results are also given when several recognised smokeless powders were fired under various conditions.

The authors are continuing their investigations, and are especially endeavouring to measure the actual temperature of explosion, in which direction considerable success has been attained.

June 7.—“Contributions to the Life-History of the Foraminifera.” By J. J. Lister, St. John's College, Cambridge.

In this paper it is shown from an examination of a large number of specimens of *Polystomella crispa* (Linn.), that the individuals of this species fall into two sets, corresponding with the forms A and B (of Munier-Chalmas and Schlumberger), which have been shown to exist in species of *Nummulitida*, *Milotida*, and other families of Foraminifera. The two forms may be distinguished as *megalospheric* and *microspheric*, being characterised by a marked difference in the size of the chamber occupying the centre of the shell.

Associated with this difference in structure there is a marked difference in the nuclei of the two forms.

Individuals of the microspheric form, whose central chamber is about 10  $\mu$  in diameter, have many small nuclei distributed through the inner chambers. Evidence is brought forward to show that in this form the nuclei multiply at first by simple division, and that ultimately they give off portions of their substance, which become distributed through the protoplasm in the form of irregular deeply staining strands. The ultimate fate of the microspheric form was not traced in *Polystomella*.

The megalospheric form, whose central chamber is generally about 70  $\mu$  in diameter, has, in the usual condition, a single large nucleus which grows in size with the growth of the protoplasm, and passes from chamber to chamber, moving towards the centre of the protoplasm contained in the series of chambers. There is evidence to show that in this form, also, the nucleus parts with portions of its substance. Ultimately the nucleus disappears, and in its place hosts of minute nuclei (1-2  $\mu$  in diameter) are found, which eventually become evenly distributed and divide by karyokinesis, the entire protoplasm

In *Orbitolites complanata* (Lamck.), in which species the microspheric form attains the larger size, specimens of this form, with young in their peripheral annuli (brood chambers) were examined. It was found that the protoplasm was withdrawn from the central chambers, being represented by the megalospheric young massed in the brood chambers. The young contain a nucleus in their primordial chamber, which maintains this position during a large part of the period of growth of this form. While the production of megalospheric young by a microspheric parent, which was recorded by Brady, was thus confirmed, the production of megalospheric young by a megalospheric parent was also observed in three cases.

The relation of nuclear characters to the two forms was analogous to that found in *Polystomella*, and a similar relation was found in *Rotalia beccarii* (Linn.) and *Calcarina hispida*, Brady.

In conclusion, the question of the relationship of the two forms, under which the Foraminifera present themselves, is discussed, and reasons are urged for regarding them as distinct from their origin.

The hypothesis that they represent the two sexes is negated by the case of *Orbitolites* in which both forms have been found producing the young of the megalospheric form, a condition incompatible with the view that either is male.

It is suggested that the two forms are members of a recurring cycle of generations, and on this view it must be supposed, from the condition presented by *Orbitolites*, that the megalospheric form may, at least in this genus, be repeated for one or more generations before the microspheric form recurs.

June 7.—“Niagara Falls as a Chronometer of Geological Time.” By Prof. J. W. Spencer.

Various estimates of the age of Niagara Falls already have been published, the maximum being 55,000 years, the minimum 6000. The author, after describing the topography and geology of the district, calls attention to the fact that the Niagara river in pre-glacial times had no existence. The peculiar extension of the chasm at the Whirlpool and the buried valley at St. David's belong to a separate and shallower buried valley,

through which the Niagara cañon has been cut. The drainage of the tableland in ancient times was across the direction of the Niagara river, and was strongly marked by bold limestone ridges, which have only been penetrated by the Falls in modern times. Even the Erie basin emptied by a route several miles west of the Niagara.

The basement of the present river channel is described, and the discharge estimated. Attention also is called to the fact that during a considerable portion of the life of the river, only the waters of the Erie basin, or 3/11 of the whole drainage of the great lakes, passed over the Falls.

From four surveys, extending over a period of forty-eight years, the mean modern rate of recession of the Falls is found to be 4.175 ft. a year. Its rate is variable with secular episodes of rapid medial recession, followed by its cessation along the axis, but with increased lateral retreat. This cycle appears to take about fifty years. This rate is, however, excessive, on account of the geological conditions favouring the rapid modern recession, but the rate taken for the mean recession under the conditions of the modern descent of the river with the present discharge is 3.75 ft. a year.

At one time a great proportion of the lake region was covered by a single sheet, or the Warren water. Upon its dismemberment—in part, at least, by the rise of the land—one large lake was formed occupying the basins of Huron, Michigan, and Superior; and another a portion of the Erie extending into the Ontario basin. The waters in these two basins were subsequently lowered, so that they fell to their rocky eastern rims; the three upper lakes discharged by way of Lake Nipissing and the Ottawa river, and the Niagara had its birth, draining only the Erie basin. Then the Niagara river descended 200 ft. In course of time the waters subsided 220 ft. more, but eventually they were raised again 80 ft. at the mouth of the Niagara, thus reducing the descent of the river from the head of the rapids above the falls to the foot of the last rapids in its course to the lake to 320 ft. During the lowest stage, Ontario lake receded twelve miles from the end of Niagara gorge, where the falls had been located at their nativity.

After a discussion of the laws of erosion, the author sketches as follows the history of the Niagara Gorge and Falls:—

First episode: Water falling 200 ft., in volume, 3/11 of modern discharge; gorge, 11,000 ft. long; duration, 17,200 years. Second episode: river descending 420 ft., in three cascades; first stage, only the discharge of the Erie waters; length of chasm, 3000 ft.; duration, 6000 years; second stage, drainage of all the upper lake; length of chasm, 7000 ft.; duration, 4000 years. Third episode: same volume and descent as in last, but the three falls united into one fall; length of chasm, 4000 ft.; duration, 800 years. Fourth episode: volume of water as at present, the level of lower lake as to-day; first stage, a local rapid making the descent of 365 ft.; work particularly hard; length of gorge, 5500 ft.; duration, about 1500 years; the second stage as at present; work easy; length of canon, 6000 ft.; descent of water, 320 ft.; rate of recession here taken as the full measured amount of 4.175 ft. a year; duration, 1500 years. Thus the age of the Falls is computed to be 31,000 years, with another 1000 years as the age of the river before the nativity of the Falls. The turning of the Huron waters into the Niagara was about 8000 years ago. A difficult question was the amount of work done in each episode. This was in part determined by the position of the remaining terraces corresponding to different stages of the river, and by the changing effects of erosion.

These terraces in the lake region have been deformed by unequal terrestrial elevation, to which the changing conditions of the river are largely due. The deformation affecting the Niagara district, since the commencement of the river epoch, amounts to 2.5 ft. per mile; east of Lake Huron, 4 ft. per mile; and at the outlet of Lake Ontario, 5 ft. per mile; all in a north-eastward direction. Taking the amount of movement in each district as representing also the proportional measure of time, then calculations can be made upon several of the beaches, and in terms of the age of Niagara their antiquity can be inferred. In the application of these results it appears that the rate of terrestrial uplift in the Niagara district is about 1.25 ft. a century; 2 ft. east of Lake Huron, and 2.5 ft. at the outlet of Lake Ontario.

These beaches lead to the conclusion that the beginning of the lake age was about 64,000, or possibly 80,000 years ago;

assuming that its waters were not held up by ice-dams. If that were so, the date would be much less remote. If the present rate of uplift continues, the Falls will be brought to an end, before they have reached Lake Erie, by the diversion of the waters of the upper lakes, by way of Chicago, to the Mississippi, which change might be expected 7000-8000 years hence.

June 14.—“Flame Spectra at High Temperatures. Part II. The Spectrum of Metallic Manganese, of Alloys of Manganese, and of Compounds containing that Element.” By W. N. Hartley, F.R.S.

The spectrum of manganese has been the subject of much investigation; the spark spectrum was examined by Huggins, Thalén, and Lecoq de Boisbaudran; the arc spectrum was studied by Ångström, Thalén, Cornu, Lockyer, also Liveing and Dewar; the flame spectra obtained from compounds of manganese were investigated by Simmler, Von Lichtenfels, Lecoq de Boisbaudran, and Lockyer, while Marshall Watts has given us accurate measurements of the wave-lengths of lines and bands observed in the spark and oxyhydrogen flame-spectra of spiegel-eisen, manganese dioxide, and other compounds of this metal.

Photographs of the spectra of metallic manganese and of manganic oxide were taken and compared. They were also compared with the spectra of the alloys of manganese. The periods of exposure varied from a mere flash in the case of spiegel-eisen when being poured into a Bessemer converter, to 30 minutes and even as much as 80 minutes with manganic oxide.

The leading features of the spectra of manganese and manganese oxide are the same, but they differ in detail, as may be observed by comparing the wave-lengths of the lines and bands in their respective spectra.

A striking group of lines, the most persistent in the whole of these spectra, is situated in the violet. The following measurements were made:—

4036.5	4034.9	Ångström, also Cornu.
4032.0	{ 4032.9 4031.8 }	Ångström.
4029.5	4029.4	Ångström.

June 21.—“A Contribution to the Study of (i.) some of the Decussating Tracts of the Mid- and Interbrain, and (ii.) of the Pyramidal System in the Mesencephalon and Bulb.” By Prof. Rubert Boyce.

Chemical Society, June 7.—Dr. Armstrong, President, in the chair.—The following papers were read:—The crystallography of the normal sulphates of potassium, rubidium, and cesium, by A. E. Tutton. The author shows that the whole of the crystallographical properties of the strictly isomorphous rhombic normal sulphates of potassium, rubidium, and cesium are functions of the atomic weight of the metal which they contain.—Observations on the nature of phosphorescence, by H. Jackson. The phenomena of fluorescence, of phosphorescence in air on exposure to light, and of phosphorescence of substances in a vacuum under the influence of the electric discharge, seem to be of the same order, and consist in a response on the part of the substances to the operation of radiant energy propagated after the manner of light in undulations of short length.—Note on the viscosity of solids, by J. Dewar. The author has investigated the viscosity of solid substances by forcing them through a narrow orifice by means of a hydraulic press; many substances, such as crystalline sodium sulphate, ammonium chloride, graphite, urea, &c., easily flow under a pressure of 30-40 tons pressure on the square inch. A number of substances, such as starch, sodium chloride, &c., could not be made to flow into wire under a pressure of 60 tons on the square inch.—Boiling points of homologous compounds; part ii., by J. Walker. The formula  $T = aM^b$  which the author has previously used to represent the boiling points of members of homologous series is now applied to a number of other such series.—The action of methyl iodide on hydroxylamine, by W. R. Dunstan and E. Goulding. Attempts to prepare  $\beta$ -methylhydroxylamine hydroiodide by the action of methyl iodide on hydroxylamine, as described by L. de Bruyn, were unsuccessful; the main product of the reaction is a trimethylhydroxylamine salt.—The reduction products of nitro-compounds, by W. R. Dunstan and T. S. Dymond. The action of various weak reducing agents on aliphatic nitro-compounds is being

examined.—Notes on meta-azo-compounds, by R. Meldola and E. S. Hanes. The authors have prepared metanitrobenzene-azo- $\beta$ -naphthol and several allied compounds.—Conversion of ortho- into para-, and of para- into ortho-quinone derivatives. III. The hydroximes of the lapachol group, by S. C. Hooker and E. Wilson. The action of mineral acids on the hydroximes of lapachol and hydroxyhydrolapachol yields the same hydroxime as is obtained by the interaction of hydroxylamine hydrochloride and  $\beta$ -lapachone; the authors are able to deduce from these facts the structural formulæ of the substances mentioned.—The behaviour of alloys in a voltaic circuit, by A. P. Laurie. If an alloy of several metals is merely a mixture in which no actual chemical combination exists between the constituents, then the E.M.F. generated by the alloy should change gradually as the composition of the alloy changes; the existence of chemical combination should be indicated by discontinuities in the curve connecting E.M.F. and composition. The author has already shown that compounds exist in the series of Cu : Sn, Cu : Zn and Au : Sn alloys, and is applying the method indicated above to other cases.

Zoological Society, June 19.—Dr. A. Günther, F.R.S., Vice-President, in the chair.—Mr. Sclater exhibited the skin of a monkey of the genus *Cercopithecus*, and pointed out that it unquestionably belonged to the local form which he had spoken of in his recent paper on the *Cercopithecus* as *Cercopithecus diana ignitus*. Mr. Sclater also exhibited the typical specimen of *Cercopithecus grayi*, Fraser, formerly in the Knowsley collection, and stated that it was the same as *C. erxlebeni*, Pucheran.—Mr. H. Scherren exhibited a bottle in which an amphipod crustacean (*Amphithoe littorina*) had built a nest and a series of runs of sand and pieces of weed.—Prof. Ray Lankester, F.R.S., read a paper on the external characters which distinguish the two Dipnoid fishes *Lepidosiren* and *Protopterus*, and pointed out that there could be no doubt that these two forms should be referred to distinct genera.—Dr. Fowler exhibited a specimen of antlers of the fallow deer, belonging to Mr. J. A. K. Wallace, of Loch Ryan, which showed the effect of the removal of one testis on the development of antlers; and made remarks on the effect of different degrees of castration upon antlers, as shown by specimens in the museum of the College of Surgeons. The continuity of variation displayed in the total length, and lengths of brow- and tray-tines, in abnormal antlers in the Natural History Museum was also commented upon.—Mr. P. Chalmers Mitchell gave an account of his observations on the perforated flexor muscles in certain birds recently dissected in the Laboratory in the Society's Gardens.—A communication was read from Messrs. R. R. Mole and F. W. Urich containing biological notes upon some of the snakes of Trinidad, B.W.I. To these notes was added a preliminary list of the species of Ophidians recorded from that island.—A communication was read from M. E. Simon containing the second portion of a memoir on the spiders of the Island of St. Vincent, based on specimens obtained through the agency of the Committee for the exploration of the Natural History of the West Indies.—A communication was read from Mr. W. E. Collinge, containing the description of a new species of slug of the genus *Janella* from New Zealand, and giving a detailed account of its anatomy.—A communication was read from Mr. R. J. Lechmere Guppy, containing an account of some Foraminifera from the Microzoic deposits of Trinidad.—Mr. Arthur E. Shipley read notes on some nematode parasites obtained from animals formerly living in the Society's Gardens.—Messrs. F. E. Beddard, F.R.S., and P. Chalmers Mitchell gave an account of the anatomy of *Palamedea cornuta* as compared with that of its allies.—A communication was read from Dr. A. G. Butler, giving an account of a collection of Lepidopterous insects made by Dr. J. W. Gregory during his recent expedition to Mount Kenia. The specimens were referred to 215 species, of which ten were stated to be new to science.

Mineralogical Society, June 19.—Prof. N. S. Maskelyne, F.R.S., President, in the chair. The following papers were read:—A chemical study of some native arseniates and phosphates, by Prof. A. H. Church, F.R.S. This paper dealt with the composition of clinoclase, linoconite, berzelite, tyrolite, and other minerals, especially as regards the water which they contain, and the amount which is lost on drying or on heating to various temperatures. The author finds calcium and carbon dioxide to be an essential constituent of tyrolite, but in berzelite to be due in all probability to intermixed calcite.—The occurrence of mispickel in the stewartry of Kikkuibright, by P. Dudgeon.—

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A goniometer for demonstrating the relation between the faces of a crystal and points representing them upon a sphere was exhibited by Miss M. Walter. In this instrument the crystal can be turned about two rectangular axes, and each face is adjusted in the usual way by telescope and collimator; a brass sphere turns rigidly with the crystal, and by an ingenious contrivance a small mark is stamped upon the sphere corresponding to each face. The angles between the faces are then ascertained by applying a graduated great circle to the sphere.—At the invitation of the President, Dr. J. E. Talmage, of Salt Lake City, gave an account of the occurrence of gigantic crystals of selenite in Wayne County, Utah, and also described a phosphate of aluminium, so-called turquoise, recently found in Utah.

Linnean Society, June 21.—Mr. C. B. Clarke, F.R.S., President, in the chair. Mr. G. Brebner exhibited and made remarks upon specimens of *Scaphospora speciosa*, Kjellm. describing with the aid of lantern-slides the structure and mode of fructification in this and other allied algæ.—Mr. J. R. Jackson exhibited the cone of a stone pine, *Pinus Pinea*, Linn., picked up by the Comte de Paris in the Coto del Rey, Seville, which had sprouted and continued to grow for a month afterwards. This peculiarity, which had been often noticed in the larch, was said to be of rare occurrence in the pine.—Mr. Thomas Christy exhibited and made remarks on a small-berried coffee-plant from Inhambane, East Africa, somewhat similar to a variety from Sierra Leone and other parts of the West Coast. It was said to be valued for its fine aromatic bitter taste, which made it useful for flavouring beans and other material ground up and sold as coffee.—Mr. A. B. Rendle gave an abstract of a paper upon a collection of plants from East Equatorial Africa, brought home by Dr. J. W. Gregory and Rev. W. Taylor, amongst which were several new species.—A paper by the President followed, on "Tabulation Areas," in which the views of Dr. A. R. Wallace and others on geographical distribution were discussed, and the best mode of tabulating results considered. The Society adjourned to November 1.

#### NEW SOUTH WALES.

Linnean Society, April 25.—The President, Prof. David, in the chair.—A contribution to a further knowledge of the cystic cestodes, by James P. Hill.—Notes on Australian Coleoptera, with descriptions of new species, part xv., by the Rev. T. Blackburn. One genus and twenty-nine species from various parts of Australia and Tasmania are described as new.—On an aboriginal implement believed to be undescribed, supposed to be a hoe, by R. Etheridge. The implement described was obtained from an aboriginal tribe living on the headwaters of the Endeavour River, N.Q., about 150 miles from the coast. It consists of the columellar portion of the body-whorl of the large melon shell ground to a cutting-edge and wedged into a hole in a stick fashioned by an iron tool. The implement is probably not of local manufacture, but was obtained by barter from one of the Torres Straits Islands.—On the life-history of Australian coleoptera, part ii., by W. W. Froggatt. An account of the life-histories of beetles bred during the season 1892-3, with a notice of their food-plants.—On some naked Australian marine mollusca, part i., by C. Hedley. Under this heading a description and drawings were presented of the external appearance of *Oscantius hilli*, n.sp., a huge sea slug from Sydney Harbour and Broken Bay, of a genus not known before from the South Seas.—Observations upon the anatomy and relations of the "dumb-bell-shaped bone" in *Ornithorhynchus*, with a new theory of its homology; and upon a hitherto undescribed character of the nasal septum in the genera *Ornithorhynchus* and *Echidna*, by Prof. J. T. Wilson. The full text of the paper, a preliminary note to which was communicated at last meeting (*vide Abstract*, March 28, 1894, p. vii.).—Description of a new *Isopogon* of New South Wales, by Baron Ferd. von Mueller, K.C.M.G., F.R.S. A rare plant with always entire leaves, from the margin of the Grose Valley in the more elevated part of the Blue Mountains. With the aspect of the S.W. Australian *I. longifolius*, it is most nearly allied to *I. anemonifolius*, R.Br., which occasionally produces uncinclid leaves (*Fragmenta*, vi. 238).—Description of some new species of *Araneida* from New South Wales, No. iv., by W. J. Rainbow.—Two new Sydney spiders are described and figured—*Drassus perleaganus* and *Cyrtarachne caliginosa*, g. et sp.n.—Australian plants illustrated, No. vii.—Genus *Notothixos*, by R. T. Baker. Two forms of *Notothixos* were

recorded whose characters do not agree with those of the three species recognised by Oliver and Bentham (but united by Baron von Mueller); and the whole five are figured.—List of mollusca collected at Green Point, Watson's Bay, by A. U. Henn, with descriptions of new species, by John Brazier. The specimens on which this list is based (in number 1365, representing 154 species) were contained in a discarded bottle found in a rock pool accessible only at very low tides. A genus new to Australia and several new species were recorded.—On a new *Patella* said to have been found at the Kermadec Islands, by John Brazier.—On a new Australian *Croton* and on a supposed new species of *Acacia*, by J. H. Maiden and R. T. Baker.—Under the name of *C. affinis*, a species allied to *C. acronychioides*, from near Tintenbar, was described. It differs from the latter species in the number and length of the stamens, the marked occurrence of petals, the persistent calyx under the fruit, the shape of the capsule (broader than long), which is both furrowed and deeply lobed, and the thin texture of the leaves.

AMSTERDAM.

Royal Academy of Sciences, May 26.—Prof. van de Sande Bakhuyzen in the chair.—Some observations on oxygen, by J. H. van't Hoff.—The remarkable fact that gaseous oxygen sometimes exhibits more energetic chemical activity in the dilute than in the more concentrated condition, has been investigated in van't Hoff's laboratory by Dr. Ewan, the course of the slow oxidation of sulphur and of phosphorus being selected for study. With phosphorus and oxygen (saturated with aqueous vapour at 20°) it was observed that for pressures of oxygen greater than 700 mm. the velocity of oxidation is excessively small or nothing at all. Below 700 mm. it increases very rapidly. This limit corresponds to that found by Joubert, below which phosphorescence begins. After reaching its maximum velocity a very simple relation exists between the rate of oxidation and the pressure of the oxygen, provided that the change in the rate of evaporation of the phosphorus, which, according to Stefan, is produced by the change in pressure, is taken into account. The rate of oxidation is then directly proportional to the pressure of the oxygen. In absence of water the oxidation also begins suddenly, but at a lower pressure (about 200 mm.). Taking into account the change in the rate of evaporation, the velocity of oxidation then reaches a maximum at a pressure which is approximately the same as that which van't Hoff formerly found to be the most favourable for the explosive combustion of phosphine. After the maximum the relation between the velocity of the reaction and the pressure could not be made out with certainty, because in dry oxygen the coating of oxide which forms on the surface of the phosphorus disturbs the regular course of the reaction. With sulphur and dry oxygen, where the slow oxidation can be conveniently followed at 160°, this relation has, however, been obtained. It appears, again taking into account the change in the velocity of evaporation, that the velocity of the oxidation is proportional to the square root of the pressure. This would appear to point to the conclusion that in the absence of water, the active part of the oxygen is only that very small part of it which is broken up into atoms. This conclusion is perhaps supported in the case of phosphorus by the composition of one of the products of the oxidation in dry oxygen, viz. P<sub>2</sub>O.—Mr. Bakhuis Roozeboom discussed the equilibrium of solutions and solid phases formed of the system: HCl, H<sub>2</sub>O and Fe<sub>2</sub>Cl<sub>6</sub>. In a three-dimensional representation the solutions which may coexist with a hydrate of Fe<sub>2</sub>Cl<sub>6</sub> form a vault, whose summit lies in the melting point of the hydrate; the isotherms are not unlike half a circle. With a compound of the three components, solutions may coexist, whose compositions are represented for each temperature by a closed curve, surrounding the point which indicates the composition of the solid compound. Two of these were discovered: Fe<sub>2</sub>Cl<sub>6</sub> · 2HCl · 8H<sub>2</sub>O and Fe<sub>2</sub>Cl<sub>6</sub> · 2HCl, 12H<sub>2</sub>O; melting points:—3° and -6°. The different ways in which the vaults for all the existing solid phases may encounter are discussed.—By diagrams and models Dr. Schoute showed that the natural connection between the homogeneous divisions of space by means of cubes and of orthic tetraikadekahedra (see Lord Kelvin's paper in NATURE, March 8 and 15, 1894) is given by the known theorem, that the plane, orthogonally bisecting a central diagonal of the cube, cuts it in a regular hexagon. Every cube of a given homogeneous division in cubes, we divide into eight equal minor cubes by means of three planes, parallel to the faces. In each of these eight minor cubes we draw the central diagonal ending in the centre O of the original

cube, and we divide these into two equal parts by means of planes orthogonally bisecting the diagonals. In this manner every original cube is divided into sixteen equal parts. The eight parts that surround the centre O of the original cube form a tetrakaidekahedron. The remaining "intercellular" parts form equal tetrakaidekahedra, the centres of which are the vertices of the original cubes.—Mr. Kamerlingh Onnes communicated the results of further experiments made by Dr. Kuenen in the Leiden Laboratory, "on the abnormal phenomena near the critical point." Dr. Kuenen has explained the abnormalities observed by Zambiasi, de Heen, and others, by impurities of the matter used. He has now repeated with the utmost care the experiments, from which Galitzine drew the startling conclusion, that ether above the critical temperature has very different densities according to its having been before entirely fluid or partly vapour. The differences found by Dr. Kuenen in the duly corrected densities at some degrees above the critical temperature are only slight, and probably due to the admixture of not more than a two-hundredth of a milligram of a non-coercible gas. This gas, if not air, perhaps originates by the decomposition of some ether during the sealing of the tube before the blowpipe.

BOOKS AND PAMPHLETS RECEIVED.

BOOKS.—Alemic Club Reprints, No. 6 (Clay, Edinburgh).—Nature's Method in the Evolution of Life, 1894 (Unwin).—Climbing in the British Isles: W. R. H. Smith (Longmans, 1894).—Tourist Guide to the Continent: N.E., 1894 (30 Fleet Street).—Elektro-chemie Erste und Zweite Liefz; Dr. W. Ostwald (Leipzig, Veit).—A Selection of Photographs of Stars, Star Clusters and Nebulæ: Dr. J. Roberts (Universal Press).—The Country Month by Month, July, 1894: J. A. Owen and Prof. Boulger (Blis).—Elementary Treatise on Natural Philosophy, 13th edition; Prof. J. D. Everet, 1894 (Blackie).—Repartition de la Pression Atmospherique sur l'Océan Atlantique Septentrional d'Après les Observations de 1870 a 1889: par le Capitaine G. Rung, 1894.—Returns of the Agricultural Statistics of British India and Native State of Mysore, 1892-3 (Calcutta, 1894).—Malaysian Spiders, Parts 1, 2, and 3: T. and M. E. Workman (Belfast, 1894).  
PAMPHLETS.—Ebbe und Fluth in Luftmeer der Erde: Prof. Dr. J. Hann (Paetel, Berlin).—Journal of the Royal Agricultural Society of England, Vol. 5, Part 2 (1894, Murray).—Proceedings of the Bath Natural History Antiquarian Field Club, Vol. 8, No. 1 (Bath, 1894).—Transactions of the Institute of Brewing, Nos. 7-8 (J. S. Phillips).

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