the nerve-fibres in the spinal cord. From his experiments the author demonstrates, in opposition to the results of many other investigators, that the channels of motor and sensitive impressions lie in the lateral, and not in the anterior and posterior columns of the cord.

THE International Congress of Physicians was opened at Brussels on Sunday by the King of the Belgians with great ceremony.

IN connection with the Science and Art Department, South Kensington, the following candidates have been successful in obtaining Royal Exhibitions of 50*l.* per annum each for three years, and free admission to the course of instruction at the following institutions:—1. The Royal School of Mines, Jermyn Street, London: John Gray, engineer; Frederick G. Mills, student; Thomas E. Holgate, farmer. 2. The Royal College of Science, Dublin: C. C. Hutchinson, engineer; Henry Hatfield, student; Thomas Whittaker, clerk.

PROF. FLOWER'S important monograph on the structure and affinities of the Musk-deer (*Moschus moschiferus*) has just appeared in the new 3rd part of the Proceedings of the Zoological Society for this year.

WE commend to our readers a paper in Tuesday's *Daily News* on the scientific work of the *Valorous*, by a member of the expedition. Under somewhat trying circumstances much good work was done. Many new and valuable facts bearing upon the very important question of the geographical distribution of particular forms have been added to those already obtained by the *Porcupine* and *Challenger*.

IN a letter in the *Morning Post*, signed "W. S. M.," attention is drawn to the provision in the New Code of the Privy Council Committee of Education for instruction in cooking, house management, &c., in elementary schools, and a very happy suggestion is made. The writer can see no reason why some portions at least of the subject should not at once be introduced into all schools which are in connection with the Science and Art Department. He then shows how very large a number of students attend the classes for Animal Physiology, Organic and Inorganic Chemistry, and Heat, and says: "There is thus already given, though scattered over four subjects, much of the instruction which would belong properly to the special subject of 'Food and its Preparation.' To make the subject an efficient one, all that is needed is to select certain portions from the subjects already taught, 'Physiology,' 'Acoustics, Light, Heat,' 'Inorganic Chemistry,' 'Organic Chemistry;' to group these portions as one subject, and to add to it some additional instruction that is not at all more difficult than much that is already given." We commend "W. S. M.'s" suggestion, indeed the whole of his letter, to the notice of the South Kensington authorities.

THE Cryptogamic Society of Scotland will hold its first Annual Conference at Perth on September 29 and 30, and October 1, the president being Sir T. Moncreiffe, of Moncreiffe, Bart., President of the Perthshire Society of Natural Science, and the secretary, F. Buchanan White, M.D., F.L.S., editor of the *Scottish Naturalist*. The following is the programme of the meeting:—Wednesday, September 29, field-excursions to Moncreiffe, Dupplin, and Scone. Thursday, September 30, (1) Arrangement and examination of specimens; (2) Business meeting (reading of papers and communications, &c.); (3) Fungus dinner. Friday, October 1, show of fungi and other cryptogamic plants in the City Hall, Perth. All fungi, &c., intended for exhibition must be delivered (addressed to the care of the "Keeper of the City Hall, Perth") not later than 10 A.M. on Thursday, September 30. Ferns in pots must be delivered between 8 and 10 A.M. on Friday, October 1. Botanists (especially in distant localities) who purpose attending the conference are requested to give early intimation of their intention, in order to facilitate arrangements. Further information may be obtained on application to the general secretary, Dr. Buchanan White, Rannoch, Perthshire; or the local secretary, Mr. J. Young, C.E., Tay Street, Perth.

A FRENCH blacksmith has devised a perforated plate, put in rotation by clockwork, and intended to place behind the lock of a safe. The consequence is that the safe cannot be opened except at certain times during business hours, when there is no danger of any robber intruding into the offices.

THE patrons of the Lille Catholic University are trying to get an hospital placed at their disposal in order to start a school of medicine, and they have offered a sum of 150,000 francs to the administration of public hospitals in order to have a *clinique* of their own. The answer has not yet been given, but it is doubtful whether the requisition will be complied with.

THE death of M. Duchesne de Boulogne, one of the most celebrated practitioners who engaged themselves in studying medical electricity, took place on Saturday, Sept. 18. M. Duchesne de Boulogne was the author of several cleverly written books on the subject. His death will be felt as a loss by those who are organising the International Exhibition of Electricity, which is to take place only in 1877, having been postponed owing to the amount of work required to collect all the objects relating to that immense science.

THE admirable "Report on the Progress of the Iron and Steel Industries in Foreign Countries," by Mr. David Forbes, F.R.S., has been reprinted in a separate form in the *Journal* of the Iron and Steel Institute.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mrs. Kent; a Common Raccoon (*Procyon lotor*) from North America, presented by Mr. W. Binder; a Goffin's Cockatoo (*Cacatua goffini*) from Queensland, presented by Mrs. Barton; an Egyptian Gazelle (*Gazella dorcas*) from Egypt, a Green Monkey (*Cercopithecus callitrichus*) from West Africa, a Brazilian Hangnest (*Icterus jamaicai*) from Brazil, a Sulphury Tyrant Bird (*Pitangus sulphuratus*), two Red-rumped Hangnests (*Cassicus hæmorrhous*), three Blue-bearded Jay. (*Cyanocorax cyanopogon*) from South America, deposited; a Getulian Ground Squirrel (*Xerus getulus*) from Morocco, six Houbara Bustards (*Houbara undulata*) from North Africa, purchased; a Wapiti Deer (*Cervus canadensis*), and a Reeves's Muntjac (*Cervulus reevesi*) born in the Gardens.

THE BRITISH ASSOCIATION

REPORTS.

Third Report on the Sub-Wealden Exploration.—Mr. W. Topley made a statement on this subject, embodying the chief points of the report drawn up by Mr. H. Willett and himself. Up to the year 1872 nothing was known as to the beds which lie below the Wealden strata in the south-east of England. The lowest beds exposed were those on the north and north-west of Battle, long worked for limestone. The age of these beds was doubtful, some geologists correlating them with the Purbecks of Dorsetshire, others regarding them as Wealden but of somewhat exceptional character. In 1872, when the Association met at Brighton, Mr. H. Willett proposed to commence a bore hole in these doubtful strata, with a twofold object: (1) to determine the order, thickness, and character of the Secondary rocks below the Weald; (2) to prove the Palæozoic rocks which were supposed to lie beneath at a depth which could be reached. Judg-

ing from what is known of the Secondary strata near Boulogne, and comparing them with those exposed in the middle of England, it was hoped that the Palæozoic rocks would be reached at a depth not greater than 1,700 feet from the surface. In August 1874 the boring had reached a depth of 1,030 feet, and was then delayed in consequence of an accident to the rods. This hole was ultimately abandoned, and a new boring was commenced in February 1875, which has been carried to a depth of 1,812 feet. At this point the work has been stopped, in consequence of great difficulties in keeping the hole clear, and it is not proposed to continue the boring further. From the surface down to 175 feet the strata are shales and impure limestones, with gypsum in the lower part. These beds are referred to Purbecks, and with them are now classed the lowest rocks exposed at the surface, formerly called the "Ashburnham Beds." From 175 to 257 feet the strata are chiefly sand and sandstones; these are held to represent the Portland Beds. Below 257 feet there is a great series of bituminous shales and clays, with occasional bands of cement stone and sandstone. Kimmeridge Clay fossils extend down to 1,656 feet at least, possibly lower; so that this formation is here at least 1,400 feet thick. The bottom beds of the boring, just reached, are oolitic in structure, and contain bands of hard limestone. To this extent, then, the Secondary rocks have been traversed, and their order and structure ascertained. A discovery of some commercial value has been made, for two companies are in existence to work the gypsum. One of these has been for some time in operation; a shaft has been sunk and the mineral is now being raised. Scarcely less important is the knowledge now attained that no supply of water can be got by deep wells or borings into the Sub-Wealden strata. As regards the Palæozoic rocks, the boring has not had the success that was anticipated. The Secondary strata have proved too thick, and there is little or no hope of reaching the older rocks here. A boring is now in progress at Cross Ness by the Metropolitan Board of Works; this will be carried through the gault, and may possibly throw some light on this question.

Report of the Committee on Erratic Blocks, by the Rev. H. W. Crosskey.—The Committee continue their record, without attempting the more ambitious task of connecting the facts they report with theories of the history of the Glacial epoch. It will be observed, however, (1) that the facts reported increase our knowledge of the area over which erratic blocks are distributed; (2) that the boulders are connected together in more definite groups, distinctly pointing to special centres of distribution; (3) that the possibilities are increasing of obtaining a more exact history of the periods into which the great Glacial epoch must be divided from the grouping and distribution of erratic blocks. Boulders and scratched stones are reported in South Devonshire. New Red Sandstone boulders occur on the left bank of the River Dart, at Waddeton, the largest measuring 6 × 3 feet, at elevations extending from 15 to 200 feet. Are they travelled masses? If so, whence did they come? When were they lodged where they now lie? What was the agent of transportation? The boulders may have been remnants of New Red beds which once covered the older formations now exclusively overlying the district; but the different levels at which they are found, the present configuration of the surface of the country, and the great weight of some of them, indicate the possibility of their having been transported by ice from some part of the district lying between Berry Head and Galmpton Common. At Englebourne scratched blocks occur of fine grained trap over an area having slate as its subsoil. Although the size of these boulders renders their mobility under the action of waves possible, yet the grooves upon them appear to indicate ice action with considerable distinctness. A group of small boulders of mountain limestone have been found in the north-east of Hertfordshire, 100 miles from their source in Derbyshire. In Nottinghamshire remarkable boulders have been exposed by a new railway cutting, many of them finely striated, which have been described for the Committee by the Rev. A. Irving. The boulders are of lias, millstone grit, and carboniferous limestone. The boulders of lias limestone are derived from the liassic strata of the immediate neighbourhood upon which they chiefly lie. The nearest millstone grit is formed at Castle Donnington and Stanton-by-Dale in Derbyshire, on opposite sides of the Trent Valley; the former place twelve miles south of west, the latter twelve miles north of west from the deposits in which they occur. The nearest carboniferous limestone corresponding to that of the boulders is found at Ticknall in Derbyshire, about eighteen miles distant south of west. The height of the group above the sea is about 200 feet. The extent of the boulder clay and deposit is at least several square miles. In the cutting between Plumtree and Stanton the boulders are largest and most numerous, and are mingled with an immense number of quartzite pebbles, the whole being compactly bound together. In Leicestershire, there is no doubt, Charnwood Forest was a centre of distribution by ice, of blocks of all sizes. The position of various boulders is reported seven miles from their source, together with a block of peculiar millstone grit, at Hoby, near Melton, which must have come from Durham or Northumberland. In Worcestershire (Bromsgrove district) ninety-three boulders have been examined, many of them of considerable size, consisting chiefly of varieties of felspathic rock. It is impossible as yet to generalise on their distribution, but it is noticeable that no specimens of granite have been observed in this district, although they occur so abundantly around Wolverhampton. A list is given of the size and position of the principal erratic blocks, which are rapidly being destroyed. The group of felspathic boulders extends through Northfield and King's Norton to Birmingham. Isolated, and in many cases striated, boulders are reported in the neighbourhood of Liverpool, including blocks of greenstone, syenite, felspathic ash, &c. On the north-west of Bradford a few boulders are reported, similar to the rocks at Scaw Fell, Cumberland, and containing small garnets. The destruction of erratic rocks is going on so rapidly through the country that the Committee earnestly request that reports may be forwarded to them of their occurrence. Some are being buried to get them out of the way of the farmers; others are built into walls, made the foundations of houses, or blasted into fragments. In some cases they constitute the foundations of church towers. A timely record will preserve many facts of large import and assistance in the discussion of problems connected with the centres of ice action, the range of the land ice, the courses of icebergs, and the existence of interglacial epochs.

SECTIONAL PROCEEDINGS

SECTION A—MATHEMATICS AND PHYSICS

On the Measurement of Wave Motion, by Prof. Frederick Guthrie.—The rate of progression of a wave in a liquid of infinite depth and extent depends upon the wave length; scarcely at all upon its height, and not at all upon either its breadth or the density of the liquid. The measurement of rate of wave-progression in open water is difficult and at best inaccurate. Natural waves generated and supported or restrained by wind have abnormal rates of travelling. Artificial waves in ponds degenerate rapidly in height and increase in wave length, and so in wave progress-rate. The time required by a wave generated in the middle of a pond in reaching the edge, is dependent on its mean wave length. Perhaps after reflexion from the edge the conditions are sequentially reversed, and the time occupied in returning is equal to that of departure. Perhaps not. I think not, because the increase of wave length (and therefore of wave progress) is a function of the height. Be this as it may, many sources of error are got rid of by using troughs of limited surface and indefinitely great depth, by causing the original and reflected wave so to interfere as to produce one or more nodes; and instead of measuring the time required for the crest of a wave to travel in a straight line over a given distance, by measuring the number of times the crest of the wave system reappears in the same place in a given time; in other words, by transferring to liquid waves the method used to measure the rate of sound in solid bodies. As far as the method is trustworthy we get by means of a trough whose diameter is one or two feet, a more accurate method of measuring the rate of wave progress than by an experiment in an ideal pond a mile across.

Experiment shows that if a concentric binodal wave system be generated in a cylindrical trough of water of more than a certain depth (say half its diameter), the following conditions hold good. A nodal ring is formed at one-sixth of the diameter from the circumference. The amplitude at the centre is double that at the circumference unless the disturbance is very great. The rate of undulation—that is, the number of times in a given time that the crest appears in the centre—does not depend sensibly upon the amplitude, nor upon the temperature, nor upon the density of the liquid. It depends almost wholly upon the wave length of the waves formed—that is, upon the diameter of the trough—and is identical with the number of beats of a pendulum whose length is equal to the radius of the trough. Hence the rate of undulation varies inversely as the square root of the trough radius or

diameter. This confirms the assertion that the rate of wave-progress varies directly as the square root of the wave length; because the rate of recurrence must vary as the rate of progression divided by the path.

Experiment shows that a wave of 1 meter wave length would travel 83·07 meters in one minute if it did not alter its wave length, and moved automatically. A cylindrical trough of water more than, say, 500 millimeters deep and 1·988 meters in diameter, will, in the latitude of London, undulate in seconds, and will remain isochronous with the London seconds' pendulum wherever they travel together.

In rectangular troughs, the wave progress is hindered. The rates of recurrence of phase in rectangular troughs are slower than in circular troughs when the wave lengths are the same; and this difference is greater when the wave length is greater. Both circular and rectangular troughs accept mononodal undulation. The rate of progress between parallel walls of a wave 1 meter long is found to be 74·7, and this is independent of the distance of the walls apart. The mononodal undulations in circular and rectangular troughs have also been examined.

The comparative empirical mean constants in minute-millimeters are—

Circular.		Rectangular.	
Mononodal. (*a*)	Binodal. (*b*)	Mononodal. (*c*)	Binodal. (*d*)

$n\sqrt{d} = 1762{\cdot}56 \quad 2613{\cdot}24$; $n\sqrt{e} = 1594{\cdot}16 \quad 2360{\cdot}04$.

where d is the diameter of the circular trough and e the length of the rectangular one.

The water in a circular trough can also undulate with two perpendicular rectilinear nodes.

Taking the same trough, it is found that the number of undulations per minute, when (*a*) the circular binodal, (*b*) the mononodal, and (*c*) the binodal rectangular systems were established, were—

$a = 106{\cdot}9 \qquad b = 71{\cdot}6 \qquad c = 94.$

These numbers a and c agree well in ratio with those of a circular elastic plate in similar vibration. The details of this communication were laid before the Physical Society in June last. They will, I hope, appear in part in the *Philosophical Magazine* for October.

SECTION B—Chemical Science

Prof. Cayley read a paper *On the Analytical Forms called Trees, with application to the theory of chemical combinations*, before a good audience composed to a considerable extent of mathematicians.

The author in commencing stated that the subject he was about to consider was more mathematical than chemical, but as the results bore considerably upon the latter subject he had introduced it in this Section. The problem to be solved was to find the theoretic number of the hydrocarbons C_nH_{2n+2}.

The only assumptions are that an atom of hydrogen can link itself to one other atom, and an atom of carbon to four other atoms. A combination of n carbon atoms can then link itself on to $2_n + 2$ hydrogen atoms at most, but this number is only attained when the carbon atoms are linked together without cycles, or so as to form a "tree": given the tree, the hydrogen atoms can be linked on in one way only, and the question thus is to find the number of trees which can be formed with n carbon atoms. The atoms, or dots representing them, are termed "knots," the lines joining two knots are termed "branches"—the trees in question are such that from each knot there proceed at most four branches; but this limitation is in the first instance disregarded. A tree may be considered as springing from any one of its knots as its root, and trees which are chemically the same thus present themselves under different forms. For the treatment of the chemically distinct forms it is necessary to introduce the notions of a "centre" and a "bicentre" (due to Prof. Sylvester); and the question is reduced to that of finding the number of the *central* trees with n knots: this is solved by the method of generating functions, viz., the number of the central trees of altitude N is given by a series of the form—

$$t\,x^{N+1} + \{t, t^2\}x^{N+2} + \{t, t^2, t^3\}x^{N+2} + \&c.$$

where the numerical coefficient of any term $t^\alpha x^{N+\beta}$ shows the number of trees of α main branches and $N + \beta$ knots. The final result as regards the carbon-trees, or say the hydrocarbons C_nH_{2n+2} is given by the following table:—

n =	1,	2,	3,	4,	5,	6,	7,	8,	9,	10,	11,	12,	13
Central	1,	0,	1,	1,	2,	2,	6,	9,	20,	37,	86,	183,	419
Bi-central	0,	1,	0,	1,	1,	3,	3,	9,	15,	38,	73,	174,	380
Total	1,	1,	1,	2,	3,	5,	9,	18,	35,	75,	159,	357,	799

so that theoretically for the body whose formula is $C_{13}H_{28}$ there exist 799 isomeric bodies.

It is worthy of remark that the mathematical theory agrees with experiments for the first five bodies, thus affording strong confirmation of the truth of the remainder.

The Professor also drew attention to the fact that any number is sometimes rather more and sometimes rather less than double the preceding number.

Prof. Armstrong suggested that probably a large number of these isomers would be unstable, illustrating his meaning by the two isomeric di-nitro-phenols, one whose melting-point was 76° C. readily passing into the other whose melting-point was 116° C., which was objected to on the ground that it was not fair to compare the action of bodies as complicated as the phenols with the simple hydrocarbons.

Prof. Clifford also made some remarks on the bodies represented by $C_nH_{2n+2-2x}$, and stated that it would be found that x represented the number of cycles that would occur in the trees.

Mr. P. Braham made some remarks on some further experiments on *Crystallisation of Metals by Electricity*, in which he stated that he had placed the positive and negative electrodes of a battery in a vessel containing a mixed solution of copper and zinc, and that with terminals of copper he obtained a dull crystallisation proceeding from the negative pole of mixed crystals of copper and zinc, and beyond this, crystals of copper alone. With terminals of zinc he got a mixture of crystals as before, and in front of these, crystals of zinc alone. But if terminals of brass (a compound of zinc and copper) are used, there is a dull crystallisation of zinc across the field. He also observed that with zinc terminals, by increasing the battery power, the crystallisation is broken up; but not so when the terminals are copper or brass, but then the crystallisation extends above and beyond the positive pole.

Mr. Gatehouse read a paper *On Silver Nitrite*, giving the results of some investigations into the causes of what is termed by photographers "woolliness" in their negative baths.

The five methods given of preparing the nitrite were as follows:—

1. By mixing solutions of potassium nitrite and silver nitrate.
2. By sensitising a collodion film and evaporating to dryness a mixture of nitrite and nitrate is obtained.
3. By fusing silver nitrate with organic matter.
4. By electrolysis of silver nitrate with platinum electrode.
5. By means of metals placed in neutral solution of silver nitrate.

By this last method he found that metals which produced reduction, viz., K, Na, Bi, Hg, As, Th, did not produce nitrite, but those which did not produce reduction, viz., Fe, Ni, Co, Mg, Zn, Cu, Pb, Sn, Sb, did produce nitrite. The former, it was observed, have an uneven equivalency, and the latter an even equivalency, with the exception of Hg and Sb, the latter of which may, like Fe, be tetratomic. The physical forms of the crystals were observed to vary from modular masses to filiform crystals.

Mr. A. H. Allen, in making some remarks *On a Method of effecting the Solution of difficultly-soluble Substances*, stated that he had found that many so-called insoluble substances could, when heated with fuming hydrochloric acid in sealed combustion tubes, be either completely dissolved or decomposed with separation of silica. In some cases where hydrochloric acid failed, sulphuric acid succeeded. The heating of the tubes was generally done by means of a water bath, but for some substances a chloride of calcium bath must be used.

Mr. J. C. Melliss read an account of the method of purification of a river by precipitation, at present adopted at Coventry. He stated that 2,000,000 gallons of sewage liquor, contaminated by dye, refuse, &c., were daily passed through these works and completely purified. The process employed is briefly the follow-

ing:—The water of the river, after being mechanically strained from solid impurities, is passed into tanks, where it is mixed with sulphate of alumina; it is then passed to a second set of tanks where it is mixed with milk of lime, and thence on to a field or filter bed 4½ acres in extent, which ejects 80,000 gallons of water per hour, pure enough for fish to live in. The greatest difficulty to be contended with was the freeing of the precipitated matter from the water, of which it contained 80 per cent.; this quantity, however, was considerably reduced by means of mechanical appliances, which reduced the water to such a percentage that it could either be dried (and so rendered portable) by heat, or by mixing it with some substance which increased its manurial value. In conclusion, the author stated that the primary object was to secure sanitary rather than commercial success, and that this certainly had been achieved at a cost of about sixpence per head per annum for a population of 40,000.—Some discussion ensued as to the relative merits of the method of irrigation and the method just described.—In reply, Mr. Melliss said that he was not prepared to say that the Coventry method was the best in all localities; the physical characteristics of the land in neighbourhood must always be taken into account, as of course it would make a great difference whether the soil consisted of clay or of sand.

Prof. Debus read a paper *On the chemical theory of Gunpowder*, in which he stated that nothing illustrated in so striking a manner the molecular changes produced by chemical action as the explosion of gunpowder. He said that some years ago the eminent French chemist Berthelot showed that if CO_2 be passed into a mixture of BaO and CaO in insufficient quantity to precipitate the whole of the barium and calcium as carbonate, then neither is the whole of the barium precipitated nor the whole of the calcium, but they are precipitated in a certain definite proportion, which is a multiple of their molecular weights. Hence, in general, if a mixture of the salts A and B be decomposed by some other substance, C, in insufficient quantity to decompose the whole of both, then the bodies formed will be $AC_1 + BC_2$ where $C_1 + C_2 = C$; and moreover, if the quantity of B is doubled or trebled, &c., the quantity C_2 will be increased in a definite proportion. After making some further remarks of a like nature on the decomposition of a mixture of $BaCl_2$ and $CaCl_2$ by CO_2, and also of the explosion of mixture of H and CO with an insufficient supply of oxygen (as investigated by Bunsen), the Professor went on to show that the same arguments might be applied to the explosion of gunpowder which was a mixture of carbon, sulphur, and nitrate of potash.

He then placed upon the black board the result of one of a large number of analyses of one grain of powder.

Compound.			Grain.			
(1) K_2CO_3	...	...	·3098	...	...	·00224
(2) $K_2S_2O_3$	...	...	·0338	...	...	·000177
(3) K_2SO_4	...	...	·0658	...	...	·000378
(4) K_2S	...	...	·1055	...	...	·00096
(5) CO	...	...	·0473	...	...	·00170
(6) CO_2	...	...	·2770	...	...	·0629 *

In addition to these were also formed in *small* quantities the following: potassium sulphocyanide, potassium nitrate, ammonium carbonate, sulphur, sulphuretted hydrogen, marsh gas, hydrogen, and nitrogen, most of which appear to have been the result of gaseous impurities in the carbon.

Referring to the table it will be seen that by adding up the total molecular value of the sulphur salts we get ·00151, which bears to the molecular weight of potassium carbonate (·00224) the ratio 2 : 3 nearly. Hence it is inferred that at the first moment of combustion the potassium in the saltpetre divides itself into five parts, two of which go to unite with the sulphur, and three to form the carbonate. Again, it will be seen that the carbonic oxide bears to the potassium very nearly the simple ratio 3 : 4. The CO_2 must have been formed in more than one reaction, because it does not give any simple molecular ratio. The conclusions thus arrived at are, that in the first moment of explosion the sulphur existed either as sulphite or as sulphate, and that the carbonic oxide must have been formed simultaneously with the potassium carbonate. The equations of the decomposition of gunpowder would then be the following:—

(1) $24KNO_3 + C_{35} + O = 12K_2CO_3 + 9CO_3 + 14CO_2 + 12N_2$
(2) $16KNO_3 + C_8 + S_8 = 8K_2SO_4 + 8CO_2 + 8N_2$
(3) $6K_2SO_4 + C_{11} + S + O = 5K_2S + K_2S_2O_3 + 11CO_2$.

The first two reactions taking place simultaneously.

* The third column is the number found by dividing each quantity by the corresponding molecular weight.

Prof. Thorpe, in giving some account of a *New Compound of Fluorine and Phosphorus*, said that having had some occasion recently to make a considerable quantity of the terfluoride of arsenic, by heating calcium fluoride with arsenious acid in the presence of Nordhausen sulphuric acid, he was induced to study the behaviour of this body with various other substances. When this terfluoride of arsenic is dropped into a solution of the pentachloride of phosphorus, such an immense amount of heat is evolved that it is necessary to keep the vessel surrounded with a freezing mixture, and dense white fumes are given off, while only chloride of arsenic remains in the solution. This gas is decomposed by water, but may easily be collected over dry mercury, in which condition it may be kept, but after some time the glass is observed to become dim. The specific gravity of the gas answers to the formula PF_5, and its molecular weight is 63. It acts readily upon alcohol, but the substance formed quickly corrodes glass. It is believed that it will be found to be a condensable gas under a pressure of six or seven atmospheres. It is not impossible that when decomposed by the electric spark it may give *fluorine*. It is remarkable as the only known pentatomic compound of phosphorus.

Mr. B. J. Fairley, F.R.S.E., read a paper *On New Solvents for Gold, Silver, Platinum, &c., with explanation of so-called Catalytic Action of these Metals and their Salts on Hydrogen Dioxide*, in which he stated that it was perfectly easy to dissolve silver in dilute acids, as acetic, sulphuric, or hydrochloric, provided hydrogen dioxide were present in the solution, and that if under the same circumstances the silver were dissolved in nitric acid no lower oxides were evolved. Repeating the experiments with gold, it was found that acetic and nitric acids scarcely dissolved it at all, but hydrochloric acid readily, and without the evolution of free chlorine. Some remarks were also made on the great liberation of heat observed when two unstable compounds of oxygen react upon one another so as to produce more stable compounds, especially with reference to the heat evolved during the decomposition of ozone and hydrogen dioxide, the author stating that this great *heat* must correspond to a great *force* of union.

The same gentleman also made some remarks *On the Use of Potassium Dichromate in Grove's and Bunsen's Batteries to ensure constancy*, in which he stated that he had used a small quantity of that substance dissolved in the nitric acid, and had found that the battery remained constant so long as any chromic acid remained to be reduced, and that no red fumes appeared.

Two other papers were also communicated by the same author: (1) *On a New Process for the separation of Lead, Silver, and Mercury (Mercurous) Salts*; (2) *On a Process for the Preparation of Periodates, with their application as a Test for Iodine and Sodium.*

Dr. J. H. Gladstone read a paper *On the relation of the Acids and Bases in a mixture of Salts to the original manner of combination.* In a former set of experiments the author had shown that if a molecule of copper nitrate and a molecule of potassium sulphate be dissolved in any quantity of water, and two molecules of potassium nitrate with one molecule of copper sulphate be dissolved in an equal quantity of water, then the colour produced is the same: and similarly for other sets of salts. The author, however, thought that the colours of these mixtures being comparatively faint, it would be better to try mixtures of colourless salts, and add to these mixtures some substance such as ferric sulpho-cyanide, ferric mæconate, or bromide of gold, whose colour is easily reduced. Accordingly, he mixed together potassium sulphate and magnesium nitrate, and the corresponding salts potassium nitrate and magnesium sulphate; also acetate of potassium and nitrate of lead, and the corresponding salts, &c.; in every case these were found to reduce the colour of ferric sulpho-cyanide equally. All the experiments united to confirm the supposition that the effect of a mixture does not depend upon the position of the acids and bases in it, so long as the proportions of each remain the same.

Dr. Russell asked if the amount of colour would indicate a small change in the nitrate, and also if the element *time* had been taken into the experiments.

Dr. Tilden preferred the old method, on the ground that by adding a reagent new conditions are introduced.

In reply, Dr. Gladstone said that the ferric sulpho-cyanide was much more delicate than the solutions of copper salts.

Dr. J. H. Gladstone read two notes, *On the Copper-Zinc Couple*, by himself and Mr. Alfred Tribe. In the first he showed that whereas a piece of zinc in dilute sulphuric acid (3½ in 1,000 parts of water) gave off seven volumes of hydrogen in one hour,

the same piece of zinc, when covered with spongy copper, gave off eighty volumes in one hour, which showed an elevenfold increase for an addition of the negative element of only 0·11 per cent. In the second note he showed that if a quantity of arsenical zinc foil was "coupled," washed and heated with water, and two litres of hydrogen evolved therefrom were passed through a tube heated to redness, not a trace of arsenic was observed; but when a portion of the same arsenical zinc was treated with dilute sulphuric acid, and two litres of hydrogen evolved by the action were passed through a heated tube as before, ·0019 gramme of arsenic was deposited in the cool part of the tube. Arsenical zinc, when covered with spongy copper and acted upon with dilute sulphuric acid, also gave arseniuretted hydrogen. This appears to show that it is not the copper, but the inability of the arsenic to get into solution when hydrogen is made from water and the "couple," which is confirmed by adding an aqueous solution of arsenic to the same couple, when the mirror immediately appears.

The same gentleman also read a paper by the same authors, in which it was shown that if aluminium be "coupled" with more negative metals, such as copper or platinum, then at the ordinary temperature of the air in the latter case, 4 c. c. of hydrogen are evolved in twenty-two hours, and if the temperature be raised to 100° C., in the first six hours 484 c. c. are evolved. Aluminium alone, according to Deville, only decomposes water at a white heat.

The President read a paper *On an apparatus for estimating Carbon Bisulphide in Coal Gas*. The principle upon which the success of the method depends is the following:—When carbon bisulphide is heated in the presence of hydrogen, sulphuretted hydrogen is formed.

The apparatus consists of a flask filled with pebbles and asbestos (to expose a large surface to the action of heat), and surrounded by fire-clay cylinders, in which gas is kept burning. This flask is connected through a solution of lead with an aspirator. There are other connections also by means of which gas from the source requiring to be tested circulates through the flask and is burnt. When the flask has been heated for about twenty-four hours continuously (to expel all moisture), a measured quantity of water is drawn off from the aspirator, which causes the same volume of gas to bubble through the lead solution, and on account of the presence of sulphuretted hydrogen to produce a decolorisation of the lead solution. A similar vessel containing the same quantity of lead solution and a *known* quantity of sulphuretted hydrogen is placed beside it, the gas being allowed to bubble through the first until the colour is judged to be equally intense; the amount of sulphuretted hydrogen in a known volume of the gas is thus found, and hence the amount of carbon bisulphide. Having once got the apparatus started, gases from several different sources may be tested.

Prof. A. Oppenheim made some remarks on *oxyuvitic acid*, which he stated belonged to the aromatic series, and said he was able to show that it could be prepared from its elements, thus making the fifth of that series which could be prepared by synthesis. The formula of the acid he showed to be $C_6H_2\begin{cases}CH_3\\OH\\COOH\\COOH\end{cases}$ thus making it a derivative of benzole. It gives a reddish brown colour with ferric chloride in the presence of alcohol. If it is slightly heated it changes its composition to $C_6H_3\begin{cases}CH_3\\OH\\COOH\end{cases}$ which gives a violet colour under the same circumstance: if it is still further heated it is converted into $C_6H_4\begin{cases}CH_3\\OH\end{cases}$ or cresole.

The Professor also made some remarks on the derivatives of mercaptan, which were founded on some researches of Dr. Williamson on the action of chloroform.

Mr. Chas. T. Kingzett read a paper *On the Oxidation of Essential Oils*, which he observed was a continuation of papers which had previously been communicated to the Chemical Society. The object of the paper was to give some results on the limited oxidation (by air) of terpenes of the general formula $C_{10}H_{16}$, certain terpenes of the formula $C_{15}H_{24}$, and cymene, $C_{10}H_{14}$. The terpenes experimented upon were hesperidine, myristicene (obtained in three different ways from oil of nutmeg), wormwood, all of which gave on atmospheric oxidation, peroxide of hydrogen and acetic acid. Citronella and Ylang Ylang, clove-terpene ($C_{15}H_{24}$), were found to develop no peroxide of hydrogen. Cymene obtained from three sources and exposed to atmospheric oxidation was also found to develop peroxide of hydrogen. These researches prove that in terpenes of the formula $C_{15}H_{24}$ the carbon exists in an allotropic form.

SECTION D—BIOLOGY

Department of Anthropology.

One day was chiefly occupied by a valuable series of papers on the population of the Indian region. A combined discussion on the three papers now to be noticed followed their reading. The first paper was by Sir Walter Elliot, *On the original localities of races forming the present population of India*. After some preliminary remarks, he said that the circumstance of colour was one of the most observable signs of difference of race, and the very word for the Aryan institution of caste was *varanum*, or colour, they having doubtless introduced it to distinguish themselves from the Dasyns or alien peoples with whom they came in contact on crossing the Indus. The author detailed the different colours or races now inhabiting India, and went on to remark that it is now generally admitted that the centre of dispersion from which all the peoples of the earth had migrated was Central Asia. The first great wave that surmounted the Himalayan barrier, at a time when the earth's surface was in a different condition from what it is now, could no longer be traced as a separate and distinct people. Remnants of the primeval movement were now only to be found amongst the most degraded denizens of the hills and forests, and probably in the despised slave population. The great Dravidian migration must have been made much later in time. It was probably not a simultaneous movement, but consisted of successive swarms, which would account for the existence of well-defined groups among them, which had preserved their characteristics unchanged to the present day.

But the normal representatives of the race were to be found in the mountaineers of Central India, where, protected by regions of deadly malaria encircling their highland territory, they have for ages bid defiance to hostile aggression, and preserved their habits and independence unchanged. The ground on which so many at first sight heterogeneous races were united under the title of Dravidian was mainly community of language, but that test was not infallible. A better link was furnished by similarity of form, features, colour, and structural coincidence. He maintained that the characters of Prof. Huxley's Australioid type could be traced among the classes of Dravidians, modified as was to be expected, among those most exposed to external influences, but still always apparent to a practised eye. There was nothing to show by what routes the first settlers arrived. Their advance was probably a slow and gradual percolation from different parts of the north through the mountain barrier that cuts off India from the rest of Asia. The migratory instincts or necessities of the people of Central Asia exerted themselves in all directions. Of the exact seat of the brown-skinned, wavy-haired Australioids, they had no definite knowledge. But the Mongols and Mandchurians sent off successive hordes to the south-east, whence in time the teeming population of China sought an eastern direction. Those people were thus brought into contact with tribes already settled there from a more westerly quarter. Thus the inhabitants of Siam, Burmah, and the Malayan Peninsula, spoke a monosyllabic language, but wrote it in a Dravidian character, and Mr. Hodgson found the scattered tribes around Nepaul partaking of the same mixed characters, both with regard to race and language.

Mr. Hyde Clarke's paper *On the Himalayan Origin of the Magyar and Fin Languages*, attempted to prove his theory by facts of analogy in the languages themselves, and by inferences from facts of history. He found that the affinities of Magyar and Fin were strongest for the languages of East Nepaul.

Mr. Bertram Hartshorne, of the Ceylon Civil Service, read a paper on the interesting *Weddas of Ceylon*, who still depend for their means of subsistence upon their bows and arrows, and pass their lives in the vast forests of Ceylon without any dwelling-houses or system of cultivation. There is an entire absence of any flint or stone implements among them, and their state of barbarism is indicated by the practice of producing fire by means of rubbing two sticks together, as well as by their habitual disregard of any sort of ablution. Their intellectual capacity is very slight; they are quite unable to count, or to discriminate between the colours; but while their moral notions lead them to regard theft or lying as an inconceivable wrong, they are devoid of any sentiment of religion except in so far as that may be inferred from their practice of offering a sacrifice to the spirit of one of

their fellows immediately after his decease, their idea of a future state being that they become devils after death. They never laugh, and they are very noteworthy as being the only savage race in existence speaking an Aryan language. Their vocabulary consists largely of words derived directly from the Singhalese; others indicated an affinity with Pali or Sanskrit, whilst there remained a considerable residue of doubtful origin. There was an absence of any distinctly Dravidian element.

In the discussion on these papers, Prof. Rolleston said that the ethnology and languages of Hindostan were now in pretty much the same state of fusion as those of Great Britain. Since the writings of Sir George Campbell and others, and the excellent publications of the Indian Government, he had arrived at the conclusion that the Australioid and not the Mongolian type was that which formed the substratum all through the outcast tribes of India: this accorded also with the probabilities of evolution. He believed that the earliest races of mankind were eminently Australioid, with long and narrow heads. With regard to the Weddas, it was a most interesting question whether they were really a degraded outcast Sanskrit population. Max Müller was of that opinion; and their possession of the bow and arrow, which no Australioid ever had, tended in that direction. Their skulls were not Australioid.—Sir George Campbell did not know that there was any authentic case of degradation of a race. In this instance the *primâ facie* inference seemed to him to be that the Weddas were an aboriginal race. Very small tribes which had been reduced in numbers easily changed their language under the influence of a more powerful surrounding people. From the photographs of the Weddas he pronounced their absolute identity in feature with many of the barbarous aboriginal tribes of India which he had seen, and which were distinctly non-Aryan. The use of the bow was universally known among the aboriginal races of India, which had the same notions about witchcraft, &c. as the Weddas. He asked for information as to their strength in the left arm, which Mr. Hartshorne had mentioned, for he had always supposed that the use of the bow called forth strength in the right arm.—Mr. Hartshorne said that in his experience of shooting with the bow, he had found that the great tension in pulling the bow was on the muscles of the left fore-arm. He was therefore prepared to find that the Weddas were stronger in the left arm, and it was so.—Sir Walter Elliot agreed with Sir G. Campbell as to the aboriginal character of the Weddas, but believed in the possibility of great degradation.—Mr. Hyde Clarke said they had all the appearance of being an aboriginal people. Their speaking an Aryan language was no decisive reason for calling them Aryans.

Dr. Leitner gave a graphic summary of the results of his travels and researches in the Central Asian region to which he has given the name Dardistan. He gave the following as the chief results of his investigations:—"First, we have ascertained the existence of a number of languages—one of which, Chilasi, the object of my mission, is a mere rude dialect—which were spoken at or before the time that Sanskrit became the 'perfect' language, for no one who can speak any of the derivative languages of India can class the bulk of the Dard languages among them. Secondly, the legends and traditions of the Dards show a more European tone and form than anything we find in India. Thirdly, by the adoption of the term Dardistan for the countries between Kabul, Kashmir, and Badakshan, we are driven to compare a number of races which offer certain analogies, and which may have a certain history in common since the time of Alexander the Great's invasion of India. Fourthly, our Government now know accurately what they certainly did not know before 1866, the modern history of the countries bordering on Kashmir." He found that the dialects in this district, which were in a highly inflexional state, had been preserved from deterioration by isolation and other causes. He had very little doubt that Dardistan was the first halting-place of the Aryan migration to India; the second being Kashmir. There was as great a difference among some of their dialects as between French and Italian. They had songs, legends, and fables of superior character, which he had carefully taken down and would publish. Among the evidences of their high state of civilisation were the respect shown to the female sex, and the liberty and responsibility accorded to them; their love and charity to animals; and the charm and beauty of their legends. They called themselves the brethren of the Europeans. Associated with them was a race of predatory kidnappers, very similar to them, but speaking a somewhat different language. He had found a great quantity of art products, especially sculptures, which clearly indicated a great influence of Greece upon them in very early times, probably through the existence of the Bactrian kingdom. There was no trace of the later and more extravagant influences of Buddhism, but scenes essentially Buddhistic and Asian were treated after the Greek manner, and very much with the Greek success. Expression attained a high level in these works.

Prof. Rolleston read a paper *On the Applicability of Historical Evidence to Ethnological Inquiries*, in which he showed the danger of drawing conclusions from isolated expressions of historians unless they were of the first class, such as Cæsar and Tacitus. He quoted modern examples of carelessness and inaccuracy in this respect. He referred especially to the Cimbri, who were dealt with in the next paper, and expressed his inability, from any historical investigation, to come to a satisfactory conclusion as to who they were.

Prof. Rawlinson's paper *On the Ethnography of the Cimbri* was in favour of the Celtic theory of their ethnological character. He said that in favour of the theory that they were Germans the following considerations were urged:—The supposed etymology of their names; their geographic position before they began their wanderings in Jutland and between the Rhine and the Elbe; their close alliance with the Teutons, whom all allowed to be Germans; their physical characteristics, blue eyes and flaxen hair; some points of their manners and customs, especially the fact that their armies were accompanied to battle and directed by priestesses rather than priests; and, lastly, the statements of Julius Cæsar, Strabo, Pliny the elder, and Tacitus, who include the Cimbri in their lists of German nations. The advocates of the Celtic theory relied chiefly on five arguments: (1) the name Cimbri, which they identified with the term Cymry or Cymraeg, which was still the native name of the Welsh; (2) the almost unanimous authority of the Greek and Roman writers, excepting Julius Cæsar; (3) the individual names of Cimbri, which were Celtic; (4) the fact that the Romans employed Celts as spies to bring them intelligence of the designs of the enemy during the Cimbric war; (5) the manners and customs of the people, which were held to be far more Celtic than German. They also joined issue on the argument from the physical characteristics of the race, which they held to be, according to the description given, at least as near the Celtic as the German type. Prof. Rawlinson then proceeded to examine the various arguments, holding that the balance was in favour of the Celtic origin, though it was a point open to dispute, and unless fresh data should be obtained, which seemed very unlikely, would always remain among the vexed questions which would divide ethnologists.—Dr. E. A. Freeman dissented from Prof. Rawlinson's conclusions, holding strongly to the opposite theory. He especially censured his rejection of the evidence of Julius Cæsar and Tacitus.

The ethnology of New Zealand and Polynesia received much attention owing to the presence of two distinguished authorities, the Rev. Wyatt Gill, from the Hervey Islands, and Dr. Hector, of the New Zealand Geological Survey. The connection between the origin of the Maories and the Polynesians was brought out in a series of papers followed by a valuable discussion. Mr. W. S. Vaux, in a paper *On the probable origin of the Maori race*, concluded that the Maories were the descendants of the great colonising race of yellow men who originally migrated from Central Asia. The Rev. W. Gill then read a paper *On the origin of the South Sea Islanders*. Mr. Gill said that Mr. A. R. Wallace, in his "Malay Archipelago," has advanced the theory that the Polynesians are descended from a race which once overspread a vast submerged southern continent. As the land gradually sank, a few of the aborigines may have escaped to the tops of the loftiest mountains, around which subsequently coral reefs were found. Admitting that Polynesia is pre-eminently an area of subsidence, and its great widespread groups of coral reefs may mark out the positions of former continents, Mr. Gill believed that Mr. Wallace's reference was unwarranted. (1) Supposing that human beings inhabited this great southern continent at the period of the subsidence, and that a remnant escaped, it is not probable human life could have been sustained on the tops of these mountains for any considerable time, owing to the want of food and water. (2) The theory is utterly opposed to the native accounts of their own origin, which all point to the north-west. (3) The spread of the race can easily be accounted for on the basis of historical facts. In 1862 he saw on Manuâ, the easternmost island of the Samoan group, a small boat which had accidentally drifted from Moorea, a distance of 1,250 miles, and no life was lost. A few months later on in the same year Elikana and his friends drifted in a canoe from Manihiki to Nukurairae, in the Ellice group, lying N.W. of

Samoa, a distance of 1,360 miles. Half of the party on board perished from want of food and water. In both these instances the drifting was from east to west, before the trade winds. A far more remarkable event occurred in Jan. 1858, during the prevalence of the violent easterly winds, when a numerous family of adult natives drifted from Fakaofo, in the Union group, north of Samoa, to an uninhabited spot known as Nassau Island; thence to Palmerston's Island; and finally to Maugaia, where Mr. Gill lived; altogether a distance of more than 1,200 miles in a south-easterly direction. (4) The colour, hair, general physiognomy, habits, character, and especially the language, of the Polynesians clearly indicate a Malay origin. This could not be accidental. Mr. Gill's impression was that long ages ago the progenitors of the present race entered the Pacific from the S.E. fork of New Guinea, but were driven eastward by the fierce Negrito race. The greatest distance from land to land, as they pressed eastward, would be from Samoa to the Hervey group, about 700 miles, which had been successfully performed by natives in their fragile barks under Mr. Gill's own observation.

In the subsequent discussion Prof. Rolleston expressed his opinion that there was little difference between Papuans and Australoids; the superficial differences were outweighed by great radical points of resemblance. He referred to the Rev. S. J. Whitmee's paper in the *Contemporary Review* for February 1873 as of the highest value on this question of the origin of the races of the Polynesian islands. This opinion was diametrically opposed to Mr. Wallace's.—Dr. Hector described the three chief race-types among the Maories. The first was rarely met with except in the extreme south; it was of the same type as the aborigines of the Chatham Islands, with a distinct dialect, only comprehensible by old Maories. They had a sloping forehead and strong muscular ridges on their skulls, which were very distinct from the great majority of Maori skulls. The other two types were now pretty well intermixed. One was more common in the northern extremity of the Northern Island, having yellow shock hair and high cheek-bones. The third was the ordinary Maori. He mentioned the fact that the Maories had a much better knowledge of the natural history of their country than any people he had ever heard of. The older Maories had noticed and had distinct names for nearly all their plants, not merely those that were of use; and the same names, with slight modifications, were universally in use throughout a country a thousand miles in length. They had generic names by which they grouped plants according to their affinities in a way impossible to most people who were not educated botanists. The Veronicas of New Zealand appeared under a very great variety of external forms, yet they were all identified by one name.—The Rev. W. Gill, in closing the discussion, said that difference in shade of colour was not to be relied upon as a test of difference of race; for he had seen the most intense blackness produced in Polynesia in those of the poorer classes who habitually spent much time in salt water, while the wealthier classes remained of a much lighter hue.

General H. B. Carrington, of the United States army, read a very interesting paper *On the Indians of the North-Western States*.

The Anthropological Department has been one of the best sustained this year, a result attained by its inclusiveness of a wide range of subjects relating to the history of mankind, and by reason of the high authority of many who addressed the department on their respective studies. The President showed himself a worthy leader, illuminating most of the subjects discussed and fostering discussions which were interesting alike to students and to the general public.

SCIENTIFIC SERIALS

American Journal of Science and Art, September.—The original articles are: On the formation of hail in the spray of the Yosemite Fall, by W. H. Brewer. The paper describes a visit paid to the fall in April last. The amount of water passing over the fall was estimated at 250 or 350 cubic feet a second, and the height is 1550 feet. In the spray, which stung the hands and faces of the visitors, hail or ice-pellets were found. "It will be noticed that at the time when this hail was observed, the sheet was in the full blaze of the sun from top to bottom. . . . The air near was of a temperature of 70°. Prof. Le Conte has suggested that perhaps the cooled air within the sheet is somewhat compressed and condensed in the base of the fall, and when liberated just outside by its expansion, freezes a part of the spray."—On Southern New England during the melting of the great glacier, by J. D. Dana: Part I. (we reserve our notice till the completion of the article).—On the mechanical work done by a muscle before exhaustion, and on the "law of fatigue," by the Rev. S. Haughton, M.D. Dr. Haughton announces his aim is be to show (1) That both series of experiments made by Prof. Nipher (given in the February number) are a valuable contribution to the facts of animal mechanics; (2) That they are not only consistent with "the law of fatigue" proposed by Dr. Haughton, but illustrate both that law and his "Coefficient of Refreshment;" (3) That Prof. Nipher's discussion of his own valuable experiments is worthless, as it is based on an empirical formula, which has no meaning and leads to no further consequences: (4) That the law of fatigue, which explains not only Prof. Nipher's experiments, but so many other experiments also, is entitled to be received provisionally as a law of animal mechanics, and followed up by deduction to its legitimate conclusions.—Earthquake of December 1874, by Prof. D. S. Martin. "The general phenomena presented nothing peculiar."—On some interesting equine calculi, by R. H. Chittenden.—Results of dredging experiments off New England coast, by A. E. Verrill. Four pages of tables are given, and a note is added on methods of preserving specimens. Picric acid was found to be valuable.—On the passage of two bolides in 1872 and 1874 over Middle Kentucky, by J. Lawrence Smith.—Notes on the gases accompanying meteorites, by Prof. J. W. Mallett. The purpose is to question whether Prof. Wright has sufficient evidence for his conclusion, "the stony meteorites are distinguished from the iron ones by having the oxides of carbon, chiefly the dioxide, as their characteristic gases instead of hydrogen."—On a new vertical lantern galvanometer, by Prof. G. F. Barker. The arrangement is for demonstration to a large audience, deflections obtained by induction currents, thermo-currents, voltaic currents, &c.—On another gigantic Cephalopod (*Architeuthis*) on the coast of Newfoundland, December 1874, by A. E. Verrill. The total length is estimated at forty feet.

THE *Journal of the Chemical Society* (June 1875) contains in detail Prof. Clerk-Maxwell's paper On the dynamical evidence of the molecular constitution of matter, which was duly published in NATURE. The other papers in this part are:—Researches on the action of the copper-zinc couple on organic bodies, by Dr. J. H. Gladstone and A. Tribe. The authors in this (eighth) paper treat of chloroform, bromoform, and iodoform.—On the action of nitrosyl chloride on organic bodies (second paper), by W. A. Tilden; the action on turpentine oil is considered.—A note by Prof. Story Maskelyne on the crystallographic characters of nitrosoterpene is given as appendix to the last paper.—Dr. H. Armstrong contributes a note on isomeric change in the phenol. series, which gives new proof of the energy and unceasing attention this gentleman bestows upon his interesting researches.—The last paper is a note on the effect of passing the mixed vapours of carbon disulphide and alcohol over red-hot copper, by Th. Carnelley. It was found that the following bodies were formed: $CH_3.COH$, COS (carbon oxysulphide!) C_2H_4, C_2H_2, CH_4, and H, and neither H_2S nor SO_2. The copper is superficially converted into sulphide, and amorphous carbon is deposited.

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, Aug. 1.—This number contains the concluding part of Herr Wilczek's paper on the calculation of the arithmetical mean of constant quantities. Also an account, by Herr von Jedina, of a cyclone encountered by the corvette *Helgoland* in the North Atlantic, remarkable for the steadiness with which the wind blew from east at its commencement, the great expansion of the front in comparison with the rear, and the slow rise of the barometer after passing the centre.—Among the Kleinere Mittheilungen is a notice of the late Dr. Theorell, and a paper by Herr C. Braun, on the theory of storms.

Rendiconto delle Sessioni dell' accademia delle scienze dell' istituto di Bologna.—The longer papers read at the Academy during the academical year 1874-5 were twenty-nine in number, besides numerous notes and memoirs of smaller interest. We note the following, as of special interest to our readers:—On some phenomena consequent upon contusions of the abdomen and of the spine, by Dr. P. Loreta.—On some argillaceous slate of Miocene origin, by G. A. Bianconi.—Several papers by Prof. F. Selmi, on researches made on poisonous alkaloids, their differences in properties, their determination when mixed with others in organic matter and with innocuous alkaloids,