

metals by the heating or cooling effects of a current of measured strength. The junction formed of each pair to be examined was enclosed in the bulb of an air thermometer, and the difference between the expansions produced, when the current passed in opposite directions, was measured. The electromotive order of the metals deduced from the results did not agree with the order given by electroscopic observations (*elektrische Spannungsreihe*), but it agreed with the thermo-electric order, though the electromotive forces were not found to be proportional in all cases to the thermo-electromotive forces between the same pairs of metals. (9.) "On the Properties of Pictures formed by Photographic Lenses," by Dr. Hermann Vogel. The author calls attention to certain inherent defects of pictures formed by perfect photographic lenses, that is to say, defects not due to distortion or aberration in the lenses. (10.) "On the Velocity of Light in Quartz," by Victor von Lang, contains very careful measurements of the deviations produced by a quartz prism in the ordinary and extraordinary rays for various angles of incidence. Incidentally, a measurement of the ratio of the two coefficients of expansion of quartz is also given, deduced from the change produced by alterations of temperature in the refracting angle of the prism. (11.) "On the Specific Heat of Saline Solutions and Mixtures of Liquids," by A. Wüllner. The author disputes, on the authority of the experiments made in his laboratory by Dr. Schüller, Jamin's conclusion that when two liquids are mixed together, and therefore each of them is uniformly diffused through the whole of the space occupied by the mixture, the specific heat of each increases in proportion to increased space occupied by it. (12.) "On the Fusion of Lead Bullets by striking against an Iron Plate," by Edward Hagenbach. This paper describes the melting of leaden bullets fired against an iron target, and contains a calculation showing that the kinetic energy due to the velocity assigned by "a competent military authority" is sufficient to account for the result. (13.) "An Experiment on boiling together two liquids which do not mix," by August Kundt. If steam is passed into liquid sulphide of carbon, or if sulphide of carbon vapour is passed into water, the resulting mixture of water and sulphide of carbon boils at 42.6° C., that is to say, at a temperature four degrees lower than the boiling point of sulphide of carbon alone. Also, if water and sulphide of carbon, which have been heated separately to between 43° and 46.6°, be mixed together, the mixture boils until its temperature has fallen to about 43°. These facts are in accordance with the observation of Magnus and Regnault that the vapour-tension of a mixture of two mutually insoluble liquids is equal to the sum of the vapour-tensions of the separate liquids. (14.) "On Microscopic Tridymite," by Ferdinand Zirkel. The author describes the characters of this mineral as seen under the microscope, and shows that it is of frequent occurrence in microscopic crystals. (15.) "On Acoustical Attraction and Repulsion," by K. H. Schellbach, contains experimental proofs of the statement that "the sonorous vibrations of an elastic medium urge specifically heavier bodies towards the centre of disturbance, and specifically lighter bodies away from it."

Palæontographica. Beiträge zur Naturgeschichte der Vorwelt. Herausgegeben von Dr. W. Dunker and Dr. K. A. Zittel. Band xvii., Lief. 6, 1870. This new part of the well-known "Palæontographica" contains an interesting contribution to fossil entomology in the description of the species of diptera obtained from the brown coal of Rott in the Siebengebirge. It is from the pen of the distinguished entomologist, L. von Heyden. The species, which are figured, are forty-one in number, belonging to sixteen genera, and all but nine of them belong to the moisture-loving families of the monocerous group (*Tipulide*, *Culicidæ*, &c.). Of *Chironomus* there are five well-marked species, and no less than six different forms of larvæ and pupæ, and there is also the larva almost certainly of a species of *Stratiomys*.

The most important article in the *Journal of Botany* for December is a continuation of Dr. Braithwaite's Recent Additions to our Mess Flora, accompanied by two plates. Dr. Seemann continues his Revision of the Natural Order *Biognoniaceæ*, and Mr. Ernst gives Jottings from a Botanical Note-book, relating chiefly to Caracac plants. The other articles belong exclusively to specific British botany. With the new year it is intended to increase the amount of type in the journal by about one-third, without any corresponding increase in price.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, December 6.—Robert Hudson, F.R.S., V.P., in the chair. The Secretary read a report on the additions to the Society's menagerie during the months of October and November, amongst which particular attention was called to an example of Geoffroy's Cat (*Felis Geoffroyi*), from Paraguay, purchased Oct. 10, and a specimen of the Antarctic Wolf (*Canis antarcticus*), from the Falkland Islands, presented by Mr. H. Byng, Acting Colonial Secretary of that colony.—An extract was read from a letter received from Dr. R. C. Cunningham, giving particulars of the habits of a Manatee, as observed by him in the public gardens at Rio.—A ninth letter was read from Mr. W. H. Hudson, on the Ornithology of Buenos Ayres.—Dr. J. Murie read the second part of his memoir on the anatomy of the Sea Lion (*Otaria jubata*), as observed in the male of this species which died in the Society's Gardens in 1867.—Mr. J. B. Perrin read a paper containing notes on the anatomy of the Smaller Fin-Whale (*Balenoptera rostrata*), as observed on dissection of a young female specimen of this species captured at Weymouth in April, 1870.—A communication was read from Dr. G. Hartlaub and Dr. O. Finsch, containing the description of a remarkable new Finch from the Navigators' Islands, proposed to be called *Lobiospiza notabilis*.—A communication was read from the Rev. O. P. Cambridge, containing notes on a collection of *Arachnidea* made by Mr. J. Keast Lord in the Peninsula of Sinai and on the African borders of the Red Sea.—A paper was read by Mr. G. Gulliver, F.R.S., containing observations on certain points in the anatomy and economy of the Lampreys.—Dr. A. Günther read a notice of the hitherto unrecorded occurrence of *Lates calcarifer*, a fish belonging to the Perch family, in Australia.—A communication was read from Dr. J. E. Gray, containing the description of the skull of the adult *Eupleres gondoti*. This Madagascar mammal was previously only known from an immature specimen in the Paris Museum.—A second communication from Dr. Gray contained notes on *Hapalemur simus*, a new Lemur, described from a specimen lately living in the Society's Gardens.—Messrs. Sclater and Salvin communicated descriptions of five new species of birds from the United States of Columbia.—A second communication from the same authors contained an account of the collections of birds recently made by Mr. George M. Whitely on the line of the Inter-Oceanic Railway of Honduras.—Mr. Sclater read descriptions of three apparently new species of Tyrant Birds, of the genus *Elaima*, to which were added remarks on other known species of the same group.—Mr. St. George Mivart read a paper on the myology of a species of Chameleon (*Chameleón parsoni*).—Mr. Gould exhibited and pointed out the characters of two new species of Humming Birds recently collected by Mr. Buckley in Ecuador, which he proposed to call *Chatocercus bombilius* and *Thalurania hypochlora*.

Anthropological Society, December 6.—Dr. J. Beddce, President, in the chair. Mr. W. R. Cooper exhibited and shortly described two Græco-Egyptian terra-cotta figures from the Hay Collection, showing a remarkable form of the head.—A paper was read by Mr. A. L. Lewis, "Suggestions and Reflections respecting the Peoples inhabiting the British Isles." The author divided the inhabitants of Britain into three leading types: 1st, the Kymric, long-headed, dark-haired, and light-eyed; 2nd, the Iberian, dark-haired and dark-eyed; 3rd, the Teutonic, broad-headed, light-haired, and light-eyed; the first two types being included under the collective name of Celt. After touching on some of the physical racial questions connected with the intermixture of these types, the paper concluded with some remarks tending to controvert certain popular ideas in reference to their mental characteristics, and their respective love of freedom, honesty, and chastity.

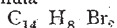
Entomological Society, Dec. 5.—Mr. A. R. Wallace, President, in the chair. Mr. Edward Saunders exhibited three new British *Hemiptera*, belonging to the genera *Salda*, *Plocionerus*, and *Hadrodema*. Mr. F. Smith exhibited *Baridius scolopaceus*, a beetle new to Britain, also *Calodera rubens*, both species captured in Kent. Mr. Butler exhibited a dark dwarf of *Vanessa urticae*. Mr. Pascoe exhibited two new forms of *Longicornia* from the Himalayas. Mr. Albert Müller exhibited photographs of galls caused by several species of *Cynips*, sent by Mr. Bassett, of Waterburg, U.S.A. Mr. S. S. Saunders exhibited a living spider,

Eresus clenizoides, from Syra, where it lived under stones and fed on large grasshoppers; it had remained without food since July. The paper read was "A Monograph on the *Ephemeridae*," by the Rev. A. E. Eaton. Mr. G. H. Verrall was elected a member of the Society.

London Institution, December 1.—Prof. Morris delivered a lecture "On Gems and Precious Stones," in which the characters of the various mineral substances used in jewellery were minutely explained. The diamond, the only representative among the gems of the elementary bodies, received special attention. The lecturer referred to its crystalline form, cleavage, hardness, specific gravity, and refractive power, the characters by which it is distinguished from crystallised quartz and other minerals. He described the dull and unattractive varieties of the diamond known as "carbonado" and "boort," and pointed out their application to steel-engraving, glass-cutting, and rock-boring. The mineralogical and geological features of the diamond-beds of India, Brazil, Borneo, South Australia, and South Africa, were discussed at length, and the frequent association of diamonds with itacolumite, gold, and rutile was referred to as a subject worthy of careful investigation. Other precious stones, such as the sapphire, ruby, emerald, beryl, topaz, jargon, garnet, spinel, and turquoise, were successively treated of, reference being made to their chemical composition, their physical properties, and their application to decorative and industrial purposes. To illustrate the lecture, Messrs. Blogg and Martin contributed a unique series of uncut diamonds exhibiting perfect crystalline forms, diamonds from South Africa, and one remarkable specimen embedded in the "cascalho," taken from a bed in Brazil. Prof. Tennant also contributed a splendid collection of diamonds in the natural state. Through the kindness of Messrs. Hunt and Roskell, the lecturer was enabled to show a fine series of precious stones and models of the great South African diamond before and after cutting. To Mr. James Gregory again, the lecturer was indebted for a collection of minerals used for ornamental purposes, models of celebrated diamonds, and samples of the gravels and rocks associated with the diamonds in South Africa.

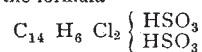
December 5.—Dr. Odling gave his sixth lecture "On Chemical Action," and illustrated his remarks on the circumstances which modify chemical action by a series of brilliant experiments, in which the oxy-hydrogen blowpipe was largely used.

Chemical Society, December 1.—Prof. Williamson, F.R.S., President, in the chair. The following gentlemen were elected Fellows:—H. E. Armstrong, Ph. D., R. Barklie, W. L. Carpenter, T. M. Crafts, Prof. of Chemistry in Cornell University, J. Dewas, T. Farries, R. Mallet, F.R.S., and Dr. Ogg. Mr. Perkin, F.R.S., read a paper "On some derivatives of Anthracene." This was a detailed account of some Anthracene derivatives, more particularly of the products resulting from the action of sulphuric acid upon dibrom and dichloranthracene. Dichloranthracene is most conveniently prepared by passing chlorine gas over benzole, holding about one-fifth its weight of purified commercial anthracene in suspension, until the mixture becomes a crystalline mass. The product is then brought out to a linen filter, drained, washed with cold benzole, dried, and then further purified by distillation and subsequent recrystallisation from benzole. Thus obtained it appears in golden yellow needles. The mean of several analyses gave 67.91 per cent. C, 3.34 per cent. H, and 28.70 per cent. Cl, which numbers agree perfectly with the formula of Graebe and Liebermann, $C_{14}H_8Cl_2$. Dichloranthracene, when greatly heated, sublimes in beautiful needles, which may be obtained of considerable size. It is fluorescent in the solid state as well as when in solution. When a boiling solution of dichloranthracene in benzole is added to a similar solution of picric acid, the mixture assumes a dark orange-red colour, and on cooling becomes filled with small bright red needles. These consist of a compound of dichloranthracene and picric acid. A determination of the dichloranthracene in this body gave numbers closely approximating to those required by the formula, $C_{14}H_8Cl_2$, $C_6H_3(NO_2)_3O$. Dibromanthracene. This product was prepared by Graebe's process. It was, however, purified first by distillation and then by crystallisation from benzole. Thus obtained, it is of a golden yellow colour. It gave, on analysis, numbers closely agreeing with those required by the formula



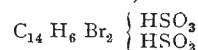
Like dichloranthracene, this body produces a beautiful red compound with picric acid. Action of Sulphuric Acid on Dichlo-

ranthracene. Dichloranthracene, when submitted to the action of fuming sulphuric acid, dissolves, forming a bright green solution, and is at the same time converted into a sulpho-acid. To prepare this acid, one part of dichloranthracene is added to about five parts of fuming sulphuric acid, and the mixture heated for a short time in the water bath. It is then gradually poured into several times its bulk of water and treated with carbonate of barium until all the sulphuric acid is neutralised. The acid solution, when filtered off from the sulphate of barium, is evaporated to a small bulk. When sufficiently concentrated, it becomes, on cooling, a shiny mass of minute orange-yellow coloured crystals, which may be drained on a porous tile. This acid has not been analysed, but, from the composition of its salts, evidently possesses the formula



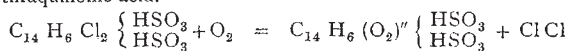
Mr. Perkin therefore proposes to call it disulphodichloranthracenic acid. It is easily soluble in water from which it is precipitated upon the addition of a little concentrated sulphuric or hydrochloric acid. It possesses a strongly acid taste and character. The acid forms salt with sodium, barium, calcium, and strontium. The barium salt is remarkable for its insolubility in hydrochloric acid.

Dibromanthracene yields with strong sulphuric acid an analogous disulphodibromanthracenic acid,



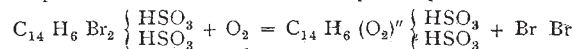
Its sodium, barium, &c., are similar to the salts of disulphodichloranthracenic acid.

Oxidation of disulphodichloro, and disulphodibromanthracenic acid. These sulpho-acids, when subjected to the influence of oxidising agents, rapidly decompose, exchanging their chlorine or bromine for oxygen, and are thus converted into disulphanthraquinonic acid.



Disulphodichloranthracenic acid.

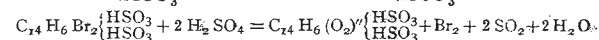
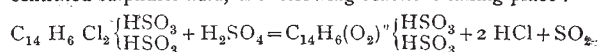
Disulphanthraquinonic acid.



Disulphodibromanthracenic acid.

Disulphanthraquinonic acid.

An analogous result is also obtained by treating them with concentrated sulphuric acid, the following reactions taking place:—



Anthracene when pure in large crystals shows a beautiful fluorescence, and so do many of the anthracene products, though curiously their solutions are comparatively poor in this respect. Anthracene and dichloranthracene in the state of vapour are not at all fluorescent, and moreover, a ray of light sent through the length of about four inches of the vapour of either body, still retains its power of rendering fluorescent bodies luminous. The experiments in this direction are, however, not yet concluded. On sealing up anthracene in a long vacuum tube with platinum poles, and allowing the discharge from an induction coil to pass through the tube, nothing particular is observed except the beautiful fluorescence of the crystals of anthracene. On examination with the spectroscope, the light showed carbon and nitrogen lines, the latter arising from the presence of a little air in the tube. Upon heating the tube, however, somewhat strongly, so as to volatilise the hydrocarbon, the ordinary colour of the discharge changed to a magnificent deep azure blue, and what is remarkable is that this blue light, when examined with the spectroscope, is perfectly continuous, and consists of blue with a little green. Dichloranthracene, when heated in a similar manner, gives an analogous result, but suffers a good deal of decomposition, anthracene changing but little. These curious results do not appear to be due to the fluorescent character of the substances employed, as naphthalene produces a similar effect, the blue light, though not so intense, being continuous. It must be observed, however, that this hydrocarbon undergoes considerable change, becoming brown and oily. Anthracene heated in a vacuum tube in the same way gives a greenish blue light, showing faint carbon bands. On exposing a solution of disulphodichloranthracenic acid to the light of one of the recent displays of the aurora borealis it was very strongly illuminated, as might be expected. Moonlight,

on the other hand, had no perceptible effect upon it, nor yet an alkaline solution of esculine. Mr. Perkin illustrated his interesting communication by a series of most beautiful experiments.

VIENNA

Imperial Academy of Sciences, October 20.—Dr. L. Manol communicated a memoir on chest and head voice, in which he described the condition of the glottis during the production of these two kinds of sounds.

November 3.—Prof. E. Stahlberger transmitted a memoir on the ebb and flow at Fiume.—Dr. Reuss presented a memoir on the Foraminifera of the Septaria clay of Pietzpuhl, containing the determination of the species figured by M. von Schlicht. Pietzpuhl possesses the richest Foraminiferous fauna of any known locality for the Septaria clay; the author has distinguished 164 species and twenty varieties, the total number found in the formation being 244 species.—Dr. C. Jelinek exhibited and explained a new anemometer, constructed for the station at Lesina, by Hipp, of Neuchatel.—Dr. T. R. von Oppolzer communicated a memoir on Winnecke's periodic comet, in which he endeavoured to show that this comet presents no extraordinary anomalies in its movement. This memoir also contained an account of the author's method of calculating disturbances.

November 10.—Prof. J. Gottlieb transmitted a chemical analysis of the Königsbrunnen at Kostreinitz, in Lower Styria, and a memoir by M. A. F. Reibenschuh, containing the analysis of the Johannesquelle, near Stainz, in Merau.—Prof. Loschmidt communicated a continuation of the results obtained by M. A. Wretschko in his researches on the diffusion of gaseous mixtures.

I. R. Geological Institute, Oct. 30.—Baron v. Richthofen, in a letter dated Peking, July 20, gives a notice of his recent geological explorations in China. On the first of January he started from Canton and travelled through the provinces of Kwangtung and Hunan to Hankan, and then, through Hupe, Honan, and Shansi, to Peking. The most important result of this journey is the discovery of the enormous extension of coal-fields and iron-ores in the province of Shansi. The southern half of this province, about 1,500 German square miles, and probably also the northern half, is an almost continuous coalfield, containing anthracite of the best quality, in layers of from twelve to thirty feet in thickness. The anthracite district is much more extensive than that of Pennsylvania, and offers incomparably more favourable conditions for working. Together with the coal, iron ores of very good quality are found in abundance.—M. Th. Fuchs gives a sketch of different discoveries in the tertiary basin of Vienna which he made last summer, in company with M. F. Karrer. The building of the new aqueduct for Vienna has caused denudations near Baden, which prove clearly that the marine clay (Tegel) of Baden overlies the Leytha limestone. Between the Cerithium (Sarmatic) beds and the overlying Congeria beds, they discovered in many localities a thin stratum, which contains the fauna of both these formations mixed, without any sensible difference in the form or size of the various species. M. E. Tietze has explored the Jurassic and Liassic strata in the southern Banat, in the environs of Bersgasyka. He found that large masses of white and red limestones, which belong to the tithonic age, immediately cover the famous Ammonite bed, near Swinitza, which has long been known as belonging to the middle Jurassic formation. Farther down are developed different members of the lias, which contain considerable layers of coal.—M. G. Stache, during the summer, was occupied with the exploration of the central crystalline masses in eastern Tyrol, chiefly in the environs of the Ziller Valley. He brings full evidence that metamorphic stratified rocks, partly even with traces of organic remains, play a considerable part in the composition of the large mountain masses of that country.

GÖTTINGEN

Royal Academy of Sciences, October 19.—M. W. Krause read a paper on the termination of the nerves in the tongue of man; and M. P. Gordan a memoir on the partial differential equations, of which the resultant R satisfies a form of the n^2 degree and a form of the m^2 degree.

November 12.—M. R. Lipschitz communicated contributions to the theory of the reversal of a function system.—A paper was also read by Dr. R. von Willemoes-Suhm on a *Balanoglossus* from the North Sea. This paper contained the description of a

third species of the genus discovered by the author in the Oeresund near Helleback, in Iceland. He names the worm *B. kufferi*, and dredged it up from a depth of 12 to 16 fathoms in a bottom of fine mud.

November 16.—A paper on asymptotic lines, by M. A. Enneper, was read.

BOOKS RECEIVED

ENGLISH.—Use and Limit of the Imagination in Science: Prof. Tyndall (Longmans and Co.).—The Intelligence and Perfectibility of Animals: G. G. Le Roy (Chapman and Hall).—The Wild Garden: W. Robinson (T. Murray).—Lessons in Elementary Physics: Prof. B. Stewart (Macmillan and Co.).—Chemical Problems: T. E. Thorpe (Macmillan and Co.).—The Modern Men of Letters: J. H. Friswell (Hodder and Stoughton).—One Thousand Gems: H. W. Beecher (Hodder and Stoughton).

DIARY

THURSDAY, DECEMBER 15.

ROYAL SOCIETY, at 8.30.—Report on Deep-Sea Researches carried on during the months July-September, 1870, in H.M. Surveying Ship *Porcupine* (conclusion): Dr. Carpenter, F.R.S., and J. Gwyn Jeffreys, F.R.S.—On the Constitution of the Solid Crust of the Earth: Archdeacon Pratt, F.R.S.—Actinometric Observations made at Dehra and Mussoorie, in India: Lieut. Hennessey.

SOCIETY OF ANTIQUARIES, at 8.30.—On the Pre-Christian Cross: Mr. H. M. Westropp.

LINNEAN SOCIETY, at 8.—On Sabadilla from Caracas (*Asagraea officinalis* Link.): A. Ernst.—A letter on the Californian Pitcher-plant (*Darlingtonia*): W. Robinson, F.L.S.

CHEMICAL SOCIETY, at 8.—On some New Derivatives of Coumarin: Mr. W. H. Perkin.

LONDON INSTITUTION, at 7.30.—On Count Rumford and his Philosophical Work: Mr. W. Mattieu Williams.

MONDAY, DECEMBER 19.

LONDON INSTITUTION, at 4.—On Chemical Action: Professor Odling, F.R.S.

TUESDAY, DECEMBER 20.

ANTHROPOLOGICAL SOCIETY, at 8.—Archaic Structures of Cornwall and Devon: Mr. A. L. Lewis.—Objections to the Theory of Natural Selection: Dr. Muirhead.—The Manx of the Isle of Man: Dr. Richard King.—The Anthropology of Lancashire: Dr. Beddoe.

STATISTICAL SOCIETY, at 7.45.—On Wool Supply: Mr. A. Hamilton.

WEDNESDAY, DECEMBER 21.

GEOLOGICAL SOCIETY, at 8.—On the older Metamorphic Rocks and Granite of Banffshire: Mr. T. F. Jamieson.—On Lower Tertiary Depo its recently exposed at Portsmouth: Mr. C. J. A. Meyer.—On the Chalk of the Cliffs from Seaford to Eastbourne, Sussex: Mr. W. Whitaker.—On the Chalk of the Southern Part of Dorset and Devon: Mr. W. Whitaker.

SOCIETY OF ARTS, at 8.—On a Method of Lighting Towns, Factories, or Private Houses by means of Vegetable or Mineral Oils: Mr. Albert Silber.

ROYAL SOCIETY OF LITERATURE, at 8.30.—On a passage in *Othello* (by the late Rev. W. W. Berry): Dr. C. M. Ingleby, For. Sec. R.S.L.—On the Great Seals of William the Conqueror: Mr. Walter De Gray Birch.

THURSDAY, DECEMBER 22.

ROYAL, at 8.30.

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